Earth Science Enterprise

NASA's Earth Science Data Resources

Tapping into a wealth of data, information, and services

Cover image:

The “blue marble” is the most detailed true-color image of the Earth to date. Much of the data in this composite came from one remote sensor—NASA’s Moderate Resolution Spectroradiometer (MODIS) on Terra.

Credits: NASA Goddard Space Flight Center (GSFC), MODIS Land Group, MODIS Atmosphere Group, MODIS Ocean Group, U.S. Geological Survey (USGS) EROS Data Center, USGS Terrestrial Remote Sensing Flagstaff Field Center, Defense Meteorological Satellite Program (DMSP).

Contents

Section 1

The Earth Observing System (EOS) is the centerpiece of NASA's Earth Science Enterprise (ESE). This long-term global change research program is designed to improve the scientific understanding of Earth's interrelated systems—land, oceans, air, ice, and biota. EOS comprises a series of satellites, a science component, and a data system. Data from EOS satellite instruments and other ESE systems provide information valuable for studying the causes and processes of global climate change.

ESE provides more than 1,800 science data products and associated services for interdisciplinary studies. The EOS Data and Information System (EOSDIS) manages and distributes these products through the members of the Distributed Active Archive Center (DAAC) Alliance. These data centers process, archive, document, and distribute data from NASA's past and current Earth science research satellites and field programs. Each center serves a specific science discipline and provides its user community with data products, information, services, and tools unique to its particular science.

Presently, EOSDIS manages and distributes data from EOS missions (e.g., ACRIMSAT, Aqua, Landsat 7, QuikSCAT, Terra), pre-EOS missions (e.g., SeaWiFS, TOMS-EP, TOPEX/POSEIDON, TRMM, UARS), and other ESE data such as Pathfinder data sets, NASA-funded field campaign data sets (e.g., BOREAS, CAMEX), and human dimension data sets (e.g., Gridded Population of the World). Section 2 gives an overview of remote sensors and provides information on many of the instruments that acquire EOSDIS data.

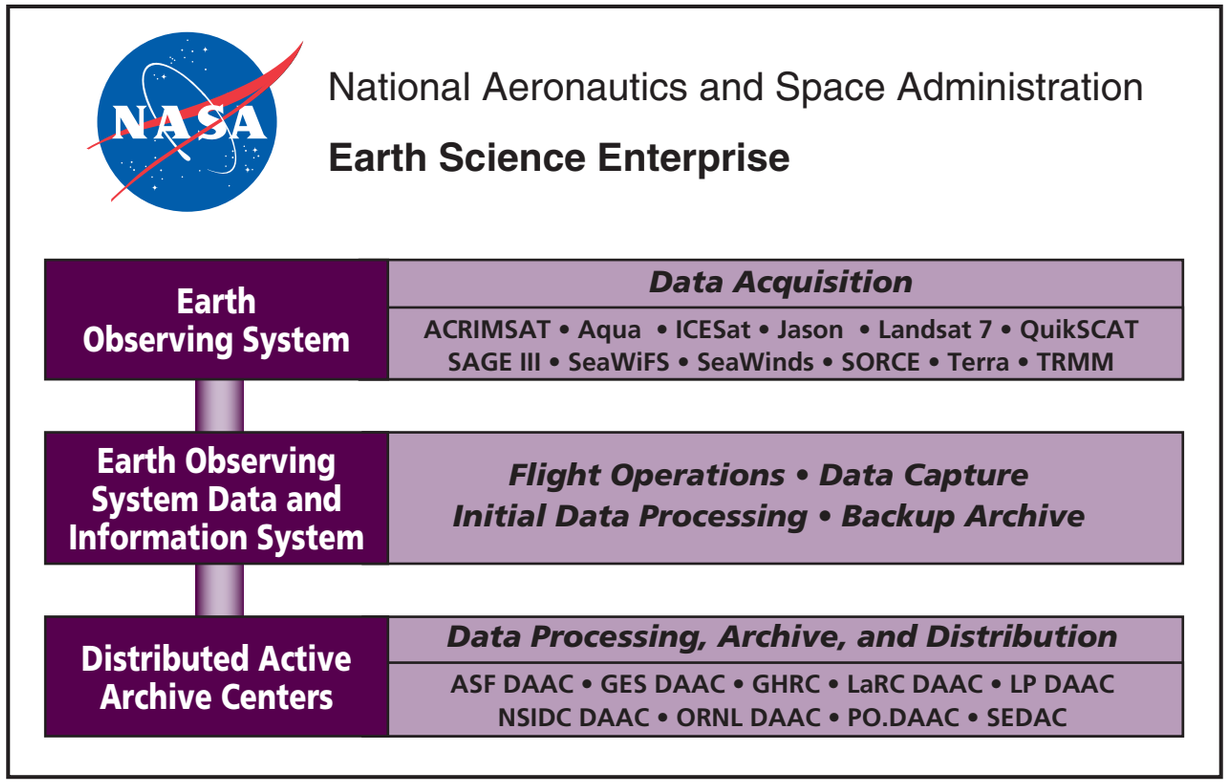
EOSDIS data products cover a wide range of physical, geophysical, biochemical, and other parameters. The products are available in various processing levels and formats. Section 3 defines the data product types, data processing levels, and several data formats.

EOSDIS data products are available from the DAAC Alliance and the EOS Data Gateway (EDG), an online search-and-order tool. Information about the DAAC Alliance data centers and their products and services is presented in Section 4. Information about the EDG and DAAC Alliance center-unique data-ordering systems is provided in Section 5.

The DAAC Alliance data centers provide many data tools specifically designed for use with their data holdings. Section 6 describes some of the data tools that are available from each data center.

This publication gives a brief overview of ESE programs and components. Greater detail is available on related NASA Web sites. Section 7 provides Web addresses for ESE programs and other relevant NASA sites.

The following figure depicts the hierarchical relationship and the responsibilities of EOS, EOSDIS, and the DAAC Alliance. It also identifies many of the ESE missions involved in data acquisition and lists the data centers of the DAAC Alliance.



Section 2

Types of Remote Sensors

Remote sensing instruments are of two primary types—passive and active. Passive sensors detect natural energy (radiation) that is emitted or reflected by the object or scene being observed. Reflected sunlight is the most common source of radiation measured by passive sensors.

Active sensors, on the other hand, provide their own source of energy to illuminate the objects they observe. An active sensor emits radiation in the direction of the target to be investigated. The sensor then detects and measures the radiation that is reflected or backscattered from the target.

Passive and active remote sensors are described in the following paragraphs.

Passive Sensors

Passive sensors include different types of radiometers and spectrometers. Most passive systems used in remote sensing applications operate in the visible, infrared, thermal infrared, and microwave portions of the electromagnetic spectrum. Passive remote sensors include the following:

- ***Radiometer***—An instrument that quantitatively measures the intensity of electromagnetic radiation in some bands within the spectrum. Usually, a radiometer is further identified by the portion of the spectrum it covers; for example, visible, infrared, or microwave. Microwave sensors are able to penetrate clouds and most rain, making them all-weather sensors.
- ***Imaging radiometer***—A radiometer that has a scanning capability to provide a two-dimensional array of pixels from which an image may be produced. Scanning can be performed mechanically or electronically by using an array of detectors.
- ***Spectrometer***—A device that is designed to detect, measure, and analyze the spectral content of incident electromagnetic radiation. Conventional imaging spectrometers use gratings or prisms to disperse the radiation for spectral discrimination.
- ***Spectroradiometer***—A radiometer that measures the intensity of radiation in multiple wavelength bands (i.e., multispectral). Many times the bands are of high-spectral resolution, designed for remotely sensing specific parameters such as sea surface temperature, cloud characteristics, ocean color, vegetation, and trace chemical species in the atmosphere and in snow and sea ice data.
- ***Hyperspectral radiometer***—An advanced multispectral sensor that detects hundreds of very narrow spectral bands throughout the visible, near-infrared, and mid-infrared portions of the electromagnetic spectrum. This sensor's very high-spectral resolution facilitates fine discrimination between different targets based on their spectral response in each of the narrow bands.
- ***Sounder***—An instrument that measures vertical distributions of atmospheric parameters such as temperature, pressure, and composition from multispectral information.

Active Sensors

The majority of active systems operate in the microwave portion of the electromagnetic spectrum, which makes them able to penetrate the atmosphere under most conditions. Active remote sensors include the following:

- ***Radar***—An active radio detection and ranging sensor that provides its own source of electromagnetic energy. An active radar sensor, whether airborne or spaceborne, emits microwave radiation in a series of pulses from an antenna. When the energy reaches the target, some of the energy is reflected back toward the sensor. This backscattered microwave radiation is detected, measured, and timed. The time required for the energy to travel to the target and return back to the sensor determines the distance or range to the target. By recording the range and magnitude of the energy reflected from all targets as the system passes by, a two-dimensional image of the surface can be produced. Because radar provides its own energy source, images can be acquired day or night. Also, microwave energy is able to penetrate clouds and most rain, making it an all-weather sensor.
- ***Scatterometer***—A high-frequency microwave radar designed specifically to measure backscattered radiation. Over ocean surfaces, measurements of backscattered radiation in the microwave spectral region can be used to derive maps of surface wind speed and direction.
- ***Lidar***—A light detection and ranging sensor that uses a laser (light amplification by stimulated emission of radiation) to transmit a light pulse and a receiver with sensitive detectors to measure the backscattered or reflected light. Distance to the object is determined by recording the time

between transmitted and backscattered pulses and by using the speed of light to calculate the distance traveled. Lidars can determine atmospheric profiles of aerosols, clouds, and other constituents of the atmosphere.

- ***Laser altimeter***—An instrument that uses a lidar to measure the height of the platform (spacecraft or aircraft) above the surface. The height of the platform with respect to the mean Earth's surface is used to determine the topography of the underlying surface.
- ***Sounder***—An instrument that measures vertical distribution of precipitation and other atmospheric characteristics such as clouds.

Remote Sensors of the Earth Science Enterprise

The following tables list and describe many of the passive and active remote sensors whose data are supported by EOSDIS. The DAAC Alliance centers archive and distribute these data. Data from some instruments are incorporated in data sets from field campaigns (e.g., BOREAS, FIFE, CAMEX). Section 4 provides information about the satellite and field campaign data holdings at each data center. (See Section 8 for the definitions of the acronyms and abbreviations used in these tables.)

Passive Sensors

Instrument	Type	Platform	Data Center	Comments
Single Channel/Total Power Radiometers				
ACRIM II	Total power radiometer	UARS	LaRC	Measures total solar irradiance.
ACRIM III	Total power radiometer	ACRIMSAT	LaRC	Measures total solar irradiance.
TIM	Total power radiometer	SORCE	GES	Measures total solar irradiance.
Multispectral Instruments				
AMSR-E	Multichannel microwave radiometer	Aqua	NSIDC	Measures precipitation, oceanic water vapor, cloud water, near-surface wind speed, sea surface temperature, soil moisture, snow cover, and sea ice. Provides spatial resolutions of 5.4 km, 12 km, 21 km, 38 km, and 56 km.
ASTER	Multispectral radiometer	Terra	LP	Measures surface radiance, reflectivity, emissivity, and temperature. Provides high-spatial resolutions of 15 m, 30 m, and 90 m.
AVHRR	Multispectral radiometer	NOAA POES	GES NSIDC	Has four or five bands, depending on platform. Telemetried resolutions are 1.1 km (HRPT data) and 4 km (GAC data).
CERES	Broadband scanning radiometer	Aqua Terra TRMM	LaRC	Has four to six channels (shortwave, longwave, total). Measures atmospheric and surface energy fluxes. Provides 20-km resolution at nadir.
ETM+	Multispectral radiometer	Landsat 7	LP	Provides spatial resolutions of 15 m, 30 m, and 60 m. Measurements are important for land surface characterization and environmental changes (vegetation cover, deforestation, and land use).
MAS	Imaging spectrometer	NASA ER-2 aircraft	GES LaRC	Has 50 spectral bands. Provides spatial resolution of 50 m.
MISR	Imaging spectrometer	Terra	LaRC	Obtains precisely calibrated images at nine different angles and four wavelengths to provide aerosol, cloud, and land surface data. Has four spectral bands. Provides spatial resolution of 250 to 275 m.

Passive Sensors (continued)

Multispectral Instruments (continued)

Instrument	Type	Platform	Data Center	Comments
MODIS	Imaging spectrometer	Aqua Terra	GES LP NSIDC PO.DAAC	Measures many environmental parameters (ocean and land surface temperatures, fire products, snow and sea ice cover, vegetation properties and dynamics, surface reflectance and emissivity, cloud and aerosol properties, atmospheric temperature and water vapor, ocean color and pigments, and ocean biological properties). Provides moderate spatial resolutions of 250 m (bands 1 and 2), 500 m (bands 3–7), and 1,000 m (bands 8–36).
SSM/I	Multispectral radiometer	DMSP mission	GHRC LaRC NSIDC PO.DAAC	Has seven channels and four frequencies. Measures atmospheric, ocean, and terrain microwave brightness temperatures at 19.35 GHz, 22.235 GHz, 37.0 GHz, and 85.5 GHz.
SMMR	Multichannel microwave radiometer	Nimbus-7	GES LaRC NSIDC PO.DAAC	Has 10 channels. Measures sea surface temperatures, ocean near-surface winds, water vapor and cloud liquid water content, sea ice extent, sea ice concentration, snow cover, snow moisture, rainfall rates, and differentiation of ice types.
Hyperspectral Instruments				
AVIRIS	Imaging spectrometer	Aircraft	ORNL	Has 224 contiguous channels, approximately 10 nm wide. Measurements are used to derive water vapor, ocean color, vegetation classification, mineral mapping, and snow and ice cover. (BOREAS Project)
SOLSTICE	Spectrometer	SORCE	GES	Measures the solar spectral irradiance of the total solar disk in the ultraviolet wavelengths from 115 to 430 nm.
Polarimetric Instruments				
POLDER	Polarimeter	Aircraft	ORNL	Measures the polarization and the directional and spectral characteristics of the solar light reflected by aerosols, clouds, and the Earth's surface. (BOREAS Project)
PSR	Microwave polarimeter	Aircraft	GHRC	Measures wind speed and direction. (CAMEX-3 Project)
Sounding Instruments				
AIRS	Hyperspectral radiometer	Aqua	GES	Measures air temperature, humidity, clouds, and surface temperature. Provides spatial resolution of ~13.5 km in the IR channels and ~2.3 km in the visible. Swath retrieval products are at 50-km resolution.
AMSU	Multichannel microwave radiometer	Aqua	GES	Has 15-channels. Measures temperature profiles in the upper atmosphere. Has a cloud-filtering capability for tropospheric temperature observations. Provides spatial resolution of 40 km at nadir.
MOPITT	Correlation spectrometer	Terra	LaRC	Measures carbon monoxide and methane in the troposphere. Is able to collect data under cloud-free conditions. Provides horizontal resolution of ~22 km and vertical resolution of ~4 km.

Active Sensors

Instrument	Type	Platform	Data Center	Comments
Altimeters - Radar and Laser (Lidar)				
ALT	Radar altimeter	TOPEX/POSEIDON	PO.DAAC	Measures altimeter height of the satellite above the sea (satellite range), wind speed, wave height, and ionospheric correction.
GLAS	Laser altimeter	ICESat	NSIDC	Measures ice sheet and other surface topography, cloud height, and aerosol layer height. Provides vertical resolution of 75 to 200 m and horizontal resolution of 150 m to 50 km.
Poseidon-2	Radar altimeter	Jason-1	PO.DAAC	Measures sea level, wave height, and wind speed.
Scatterometers				
NSCAT	Radar scatterometer	ADEOS-I	PO.DAAC	Measured ocean vector wind data. Provided spatial resolutions of 25 km and 50 km. (9 months of data received before satellite failure)
Seasat (instrument and platform)	Radar scatterometer	Seasat	PO.DAAC	Measured ocean vector winds. (3 months of data received before satellite failure)
SeaWinds	Radar scatterometer	QuikSCAT ADEOS-II	PO.DAAC	Provides spatial resolution of ~6 by 25 km and 25-km resolution for ocean vector winds.
Imaging Radar/SAR				
SAR	Synthetic aperture radar	ERS-1 ERS-2 JERS-1 RADARSAT-1	ASF NSIDC	Provides high-resolution surface imagery at 30–240 m.
Sounding Instruments				
CLS	Lidar	ER-2	LaRC	Determines vertical cloud structure. (FIRE Project)
PR	Phased-array radar	TRMM	GES	Measures 3-D distribution of rain and ice. Provides horizontal resolution of 250 m and vertical resolution of 5 km.
VIL	Lidar	Ground	LaRC ORNL	Determines vertical cloud structure. (FIRE and BOREAS Projects)

Section 3

Data Products and Types

The DAAC Alliance data centers process, archive, and distribute EOSDIS data products. The products are data sets, or groups of data sets, derived from EOS instruments and other ESE Earth science measurement systems. They can be either standard data products (SDPs) or special data products.

Standard Data Products

Data products are considered to be SDPs if they are

- Generated as part of a research investigation using EOS data.
- Recognized to have wide research utility.
- Generated routinely.
- Produced for spatially and/or temporally extensive sets of data.

SDPs are produced at the DAACs or by Science Investigator-led Processing Systems (SIPSs). These products are formally defined in EOSDIS requirements documentation.

Special Data Products

Data products are considered to be special data products if they are

- Generated as part of a research investigation using EOS data.
- Produced for a limited region or time period.
- Not accepted as standard by the EOS Investigators Working Group (IWG) and NASA Headquarters.
- Referred to as "special data products" to distinguish them from other nonstandard products such as ancillary data sets.

Special data products are normally generated at the investigators' Scientific Computing Facilities (SCFs).

Data Processing Levels for Standard Data Products

EOSDIS SDPs are processed at various levels ranging from Level 0 to Level 4. Level 0 products are raw data at full instrument resolution. At higher levels, the data are converted into more useful parameters and formats. All EOS instruments must have Level 1 SDPs. Most have products at Levels 2 and 3, and some have products at Level 4.

The data processing levels described in the table below and referenced in the following sections are identical to the EOSDIS Data Panel's definitions and are consistent with the Committee on Data Management, Archiving, and Computing (CODMAC) definitions.

Data Level	Description
Level 0	Reconstructed, unprocessed instrument and payload data at full resolution, with any and all communications artifacts (e.g., synchronization frames, communications headers, duplicate data) removed. (In most cases, the EOS Data and Operations System (EDOS) provides these data to the DAACs as production data sets for processing by the Science Data Processing Segment (SDPS) or by a SIPS to produce higher level products.)
Level 1A	Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters (e.g., platform ephemeris) computed and appended but not applied to the Level 0 data.
Level 1B	Level 1A data that have been processed to sensor units (not all instruments have Level 1B data).
Level 2	Derived geophysical variables at the same resolution and location as Level 1 source data.
Level 3	Variables mapped on uniform space-time grid scales, usually with some completeness and consistency.
Level 4	Model output or results from analyses of lower level data (e.g., variables derived from multiple measurements).

Data Format Descriptions

HDF

The Hierarchical Data Format (HDF) is designed to facilitate sharing of scientific data. HDF features include platform independence, user extendibility, and embedded metadata for units, labels, and other descriptors. Standard data types include multidimensional array, text, table, raster image, and palette. HDF files are portable, and they can be shared across most common platforms, including many workstations and high-performance computers. An HDF file created on one computer can be read on a different system without modification. HDF was developed by the National Center for Supercomputing Applications (NCSA). This format is extensible and can easily accommodate new data models, regardless of whether they are added by the HDF development team or by HDF users. For more information about HDF as a scientific data format, see http://hdf.ncsa.uiuc.edu.

HDF-EOS

The HDF for the Earth Observing System (HDF-EOS) data format is standard HDF with EOS Core System (ECS) conventions, data types, and metadata. HDF-EOS adds three geolocation data types (point, grid, and swath) that allow file contents to be queried by Earth coordinates and time. An HDF-EOS file also contains ECS core metadata essential for ECS search services. An HDF-EOS file can be read by any tool that processes standard HDF files. A data product need not fit any of the grid, point, or swath models to be considered HDF-EOS. If the product includes ECS metadata, it is a valid HDF-EOS file.

HDF-EOS is implemented as a C library extension of the standard HDF library (with FORTRAN bindings). This format ensures that data can be accessed by EOSDIS scientists and nonscientists from multiple disciplines. Use of HDF-EOS also can eliminate duplication of software development efforts, especially for analysis and visualization software. EOSDIS data providers must supply written justification for deviating from the HDF-EOS (or HDF) format. For more information about HDF-EOS, see http://hdfeos.gsfc.nasa.gov.

netCDF

The network Common Data Form (netCDF) is an interface for array-oriented data access and a freely distributed collection of software libraries for C, FORTRAN, C++, Java, and Perl that provide implementations of the interface. The netCDF software was developed at the Unidata Program Center in Boulder, Colorado, and augmented by contributions from other netCDF users. The netCDF libraries define a machine-independent format for representing scientific data. Together, the interface, libraries, and format support the creation, access, and sharing of scientific data.

netCDF data have the following features: (1) self-describing—a netCDF file includes information about the data it contains; (2) architecture-independent—a netCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers; (3) directly accessible—a small subset of a large data set may be accessed without the need to first read through the preceding data; (4) appendable—data can be appended to a netCDF data set along one dimension without copying the data set or redefining its structure; and (5) sharable—one writer and multiple readers can simultaneously access the same file.

For more information or to obtain netCDF software, see http://www.unidata.ucar.edu/packages/netcdf/. (The above information on netCDF was taken from the Unidata Web site.)

ASCII

An American Standard Code for Information Interchange (ASCII) text file is one in which each byte represents one character according to the ASCII code. ASCII files are human readable and are sometimes called plain text files. Files that have been formatted with a word processor should be transmitted as binary files to preserve the formatting.

Binary

A binary file is computer readable but not human readable. Binary formats are used for executable programs and numeric data, whereas text formats are used for textual data. Many files contain a combination of binary and text formats. Such files are usually considered to be binary.

Section 4

The DAAC Alliance is the data management and user services arm of NASA's EOSDIS. The data centers process, archive, document, and distribute data from NASA's past and current Earth-observing satellites and field measurement programs. Each center serves a specific Earth science discipline.

This section presents the member centers of the DAAC Alliance and gives an overview of their data holdings. The User Services Office at each center offers data products, information, services, and tools to assist data users. This section provides contact information for the User Services Office at each data center.

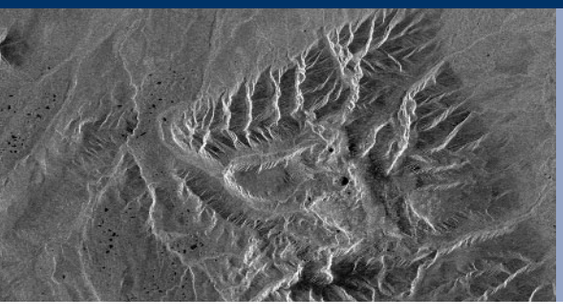
The following table lists the DAAC Alliance data centers and their Earth science areas of expertise.

DAAC Alliance

DAAC Center	Earth Science Discipline
ASF DAAC Alaska Satellite Facility DAAC	Synthetic Aperture Radar (SAR), Sea Ice, Polar Processes, Geophysics
GES DAAC GSFC Earth Sciences DAAC	Upper Atmosphere, Atmospheric Dynamics, Global Precipitation, Global Biosphere, Ocean Biology, Ocean Dynamics, Solar Irradiance
GHRC Global Hydrology Resource Center	Hydrologic Cycle, Severe Weather Interactions, Lightning, Convection
LaRC DAAC Langley Research Center DAAC	Radiation Budget, Clouds, Aerosols, Tropospheric Chemistry
LP DAAC Land Processes DAAC	Land Processes
NSIDC DAAC National Snow and Ice Data Center DAAC	Snow and Ice, Cryosphere and Climate
ORNL DAAC Oak Ridge National Laboratory DAAC	Biogeochemical Dynamics, Ecological Data, Environmental Processes
PO.DAAC Physical Oceanography DAAC	Oceanic Processes, Air-Sea Interactions
SEDAC Socioeconomic Data and Applications Center	Population, Sustainability, Geospatial Data, Multilateral Environmental Agreements

For more information about the data centers of the DAAC Alliance, see http://nasadaacs.eos.nasa.gov.

ASF DAAC Alaska Satellite Facility DAAC



- SAR
- Sea Ice
- Polar Processes
- Geophysics

The ASF DAAC is located in the Geophysical Institute at the University of Alaska Fairbanks. The DAAC is supported by NASA to acquire, process, archive, and distribute Synthetic Aperture Radar (SAR) data from polar-orbiting satellites to advance polar research and Earth science.

Available Data

ASF provides users with several types of SAR data from nearly raw (Level 0) to higher level derived products. ASF is actively archiving SAR data from the Canadian RADARSAT-1 and European Remote Sensing Satellite-2 (ERS-2). In addition, the ASF archive contains SAR data from the ERS-1 and Japanese Earth Resources Satellite-1 (JERS-1).

The majority of available data is considered restricted and available only to NASA-approved researchers. For information on becoming an approved researcher, see ASF's site at http://www.asf.alaska.edu/5_1.html.

Unrestricted derived products are available for order. Information about unrestricted products is given at http://www.asf.alaska.edu/4_1.html. Products can be ordered from the Web; some are available via FTP or through the EOS Data Gateway (EDG) (see page 5-1).

Unrestricted Data

Antarctic Mosaic

Resolution: 125 m

Availability: October 1997

Coverage: Antarctica

The first, most complete and detailed views of the Antarctic continent were obtained by RADARSAT-1 during October 1997. The RADARSAT-1 SAR Mosaic of Antarctica was produced by the RADARSAT-1 Antarctic Mapping Project (RAMP). The mosaic is available by FTP at a resolution of 125 meters and requires visualization software. See http://www.asf.alaska.edu/4_4_1_1.html.

Boreal Forest Mosaics

Resolution: 100 m to 2 km

Availability: 1997 and 1998

Coverage: North America boreal forest

JERS-1 SAR mosaics of boreal North America (Alaska and Canada) are now available on DVD. Winter and summer mosaics were assembled under the North American component of the Global Boreal Forest Mapping (GBFM) project. The DVD includes imagery extending from northern Alaska to the northeastern United States. Backscatter and texture products are provided as complete summer and winter mosaics at both 500-meter and 2-kilometer resolution. Backscatter data at 100-meter resolution are also provided as tiles of about 50 JERS-1 scenes each.

Rain Forest Mosaics

Resolution: 100 m on CD-ROM

Availability: Central America, July and August 1996; South America, February 1997; Africa, 1996 and 1997

Coverage: Major rain forests

The goal of the Global Rain Forest Mapping (GRFM) project is to acquire contiguous SAR data sets of the Earth's major rain forests using the JERS-1 satellite. ASF has available complete GRFM-produced mosaics of the Amazon, Central America, Africa, and Pantanal region. The mosaics are available on CD-ROM.

Geophysical Sea Ice Products

Availability: ERS-1 GPS, 1991 to 1993; RGPS, 1997 to 2000

Coverage: Arctic region

SAR imagery provides a detailed view of sea ice, which has a key role in the global climate system. From sequential data, sea ice features can be tracked over time. Ice motion data derived from ERS-1 SAR imagery and produced with the Geophysical Processor System (GPS) for the period from 1991 to 1993 is available for order via the EDG. In 1996, ASF began collecting and archiving RADARSAT-1 data of the entire Arctic Ocean every 3 to 6 days. The RADARSAT Geophysical Processor System (RGPS) produces a variety of ice motion data products, including new-ice thickness, which are available from ASF. See http://www.asf.alaska.edu/4_2.html.

Glacier Power

Glacier Power, a multimedia Earth sciences curriculum CD-ROM for use on Macintosh computers, was created primarily for middle school teachers. Glacier Power uses SAR data to lay a foundation in the subject of glacier dynamics through the use of imagery and cartoon characters.

Restricted Data

RADARSAT-1 C-Band SAR System

Resolution: 10 to 600 m

Availability: February 1996 to present

Coverage: Within a circle of 3,000-km radius centered on ASF and McMurdo Station (Antarctica)

The side-looking radar has a range of incidence angles from approximately 20 to 60 degrees. Swath widths range from approximately 50 to 500 kilometers. Significant coverage outside the ASF and McMurdo Station masks is also available. New acquisitions are available both within and outside the ASF and McMurdo Station masks. RADARSAT-1 data are the property of the Canadian Space Agency (CSA).

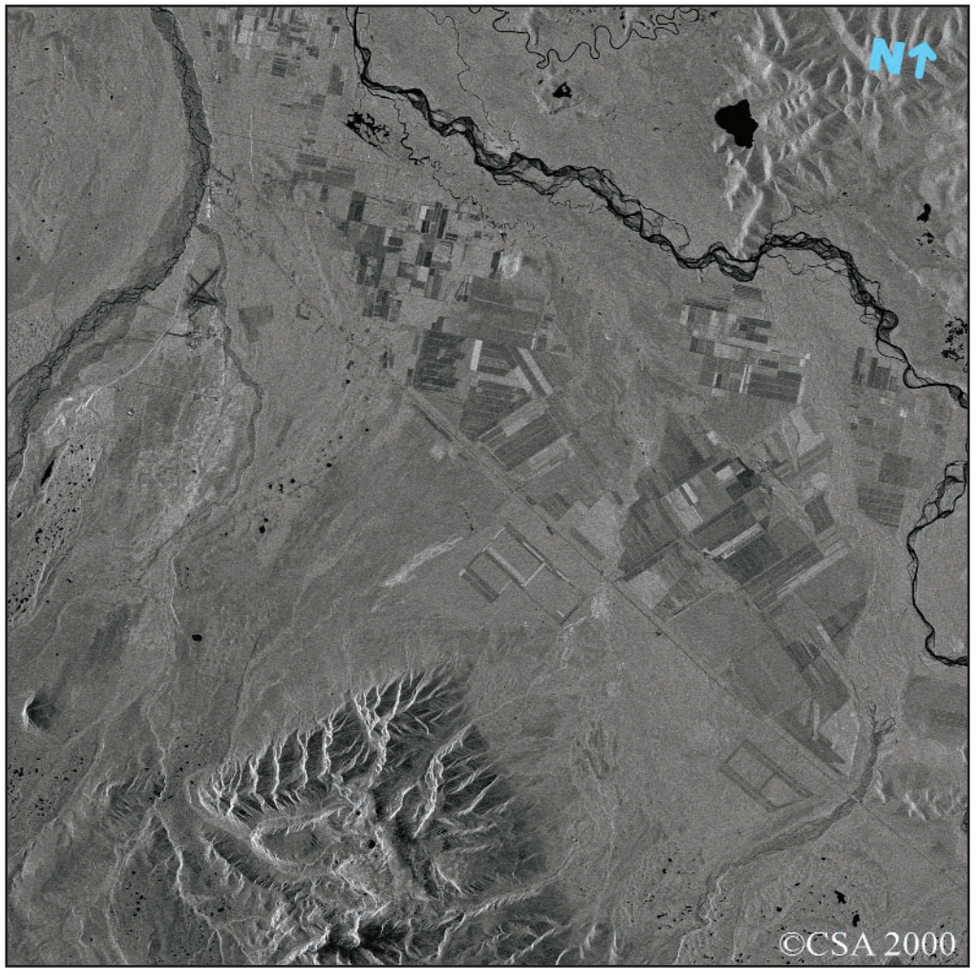
RADARSAT-1 SAR Mosaic of Antarctica

This 25-meter resolution product of the RAMP is available as a 15-DVD set.

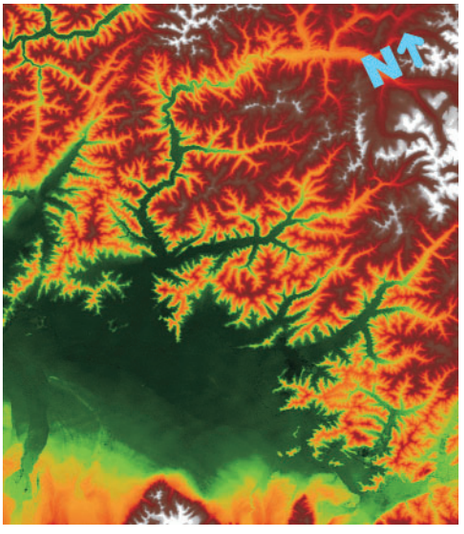
ERS-1 and ERS-2 C-Band SAR Systems

Resolution: 30 to 240 m

Availability: ERS-1, August 1991 to June 1996; ERS-2, October 1995 to present



This SAR image of Delta Junction, Alaska, was acquired August 21, 2000, by the RADARSAT-1 satellite using the Fine-1 beam mode. The rectangular features in the central portion of the image are agricultural fields. To the north and east of the agricultural fields is the Tanana River, while the prominent feature at the bottom of the image is Granite Mountain. The image area is approximately 50 by 50 km.



This 30-m digital elevation model of the Delta Junction area was created from ERS-1 and ERS-2 tandem mission data. The colors reflect varying elevations, with green representing the lowest elevations and white the highest. The coverage area is approximately 130 by 100 km.

Note: Granite Mountain shown in the SAR image appears in the bottom left edge of this image. The scale, coverage, and orientation of the two images differ.

Coverage: Within a circle of 3,000-km radius centered on ASF and McMurdo Station

The side-looking radar has an incidence angle of 23 degrees and a 100-kilometer swath width. ERS-2 is a current mission, and new acquisitions are available within the stated coverage. ERS-1 and ERS-2 data are the property of the European Space Agency (ESA).

JERS-1 L-Band SAR System

Resolution: 30 to 240 m

Availability: May 1992 to October 1998

Coverage: Within a circle of 2,600-km radius centered on ASF

The side-looking radar has an incidence angle of 35 degrees and a 75-kilometer swath width. Limited coverage outside the ASF mask, including extensive rain forest and boreal forest data, is also available. JERS-1 data are the property of the National Space Development Agency (NASDA) of Japan.

Data Tools

ASF has developed a large number of software tools that allow users to ingest and manipulate data. The tools support all ASF satellite SAR data sources (ERS, JERS, and RADARSAT) at various levels, from unprocessed raw data (Level 0) to single-look complex (SLC) and amplitude data (Level 1). They handle all available formats, the Sky Telemetry Format (STF) as well as the Committee on Earth Observation Satellites (CEOS) format.

The SAR tools include basic modules such as visualization, terrain correction, geocoding, mosaicking, and data format conversions. The Interferometric Synthetic Aperture Radar (InSAR) tool suite supports the user in carrying out all the necessary processing steps to generate a geocoded digital elevation model from any of the input formats.

Data Access

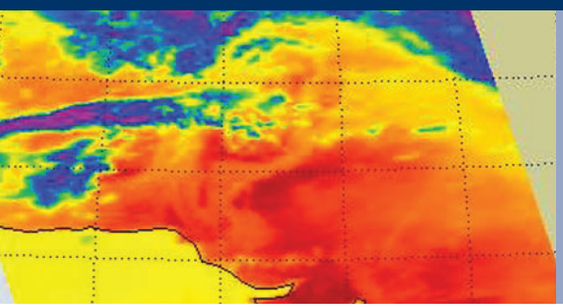
Online access to ASF DAAC data is available through the EDG data search-and-order system (see page 5-1).

For assistance or additional information, contact

ASF DAAC User Services
Alaska Satellite Facility
University of Alaska Fairbanks

Phone: +1 907–474–6166
Fax: +1 907–474–2665
E-mail: asf@eos.nasa.gov *or*
uso@asf.alaska.edu
Web: http://www.asf.alaska.edu

GES DAAC Goddard Space Flight Center Earth Sciences DAAC



- Upper Atmosphere
- Atmospheric Dynamics
- Global Precipitation
- Global Biosphere
- Ocean Biology
- Ocean Dynamics
- Solar Irradiance

The GES DAAC provides data and services that enable users to fully realize the scientific, educational, and application potential of global climate data. GES DAAC data and services are responsive to user needs, accommodating to their unanticipated demands, and innovative in availing them of the latest appropriate technology.

Available Data

AIRS/AMSU-A/HSB on Aqua

Resolution: AIRS IR at 13.5 km at nadir, 41 by 21.4 km at the scan extremes, and 1 km vertical; AIRS VIS/NIR at 2.3 km at nadir; AMSU-A at 40.5 km at nadir; HSB at 13.5 km at nadir

Availability: AIRS and AMSU-A, September 1, 2002, to present; HSB, September 1, 2002, to January 31, 2003

Coverage: Global, twice daily swath (daytime and nighttime)

The Atmospheric Infrared Sounder (AIRS) is a high-spectral-resolution spectrometer with 2,378 bands in the thermal infrared (IR) and 4 bands in the visible and near infrared (VIS/NIR). AIRS and its two sounder partners—the Advanced Microwave Sounding Unit A (AMSU-A) and the Humidity Sounder for Brazil (HSB)—form the AIRS Sounding System. Since reaching polar orbit in May 2002, this system has been providing accurate measurements of air temperature, humidity, clouds, and surface temperature. GES DAAC distributes Level 1B and Level 2 radiometric, geolocation, and higher level products. See http:/daac.gsfc.nasa.gov/atmodyn/airs/.

Climatology Interdisciplinary Data Collection (CIDC)

Resolution: 1 by 1 deg (some 2 by 2 deg and 5 by 5 deg); monthly means

Availability: 10- to 20-year periods; some long-term climatologies from 1850, covering more than 150 years

Coverage: Global

CIDC data consist of more than 70 global climate parameters related to the atmosphere, land, ocean, biosphere, cryosphere, and Sun. See http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/FTP_SITE/inter_disc.html.

GMAO Products

Resolution: 2 by 2 deg

Availability: 1985 to 1993

Coverage: Global

The Global Modeling and Assimilation Office (GMAO) four-dimensional, assimilated data contain global atmospheric profiles of model-generated winds, temperature, surface parameters, water vapor, and radiative heating.

Greenhouse Effect Detection Experiment (GEDEX)

Availability: 10-year period spanning the 1980s for many data sets

Coverage: Local, regional, or global, depending on the data set

The GEDEX collection contains more than 60 data sets with parameters relevant to greenhouse gas research, including surface and upper air temperatures, solar irradiances, radiation budget, clouds, and greenhouse gases.

ISLSCP Initiative I: Global Data Sets for Land-Atmosphere Models

Resolution: 1-deg grid

Availability: 1987 to 1988

Coverage: Global

International Satellite Land Surface Climatology Project (ISLSCP) Initiative I monthly, monthly 6-hourly, and 6-hourly data contain near-surface meteorology, vegetation, biophysics, hydrology, radiation, soils, snow, and ice parameters.

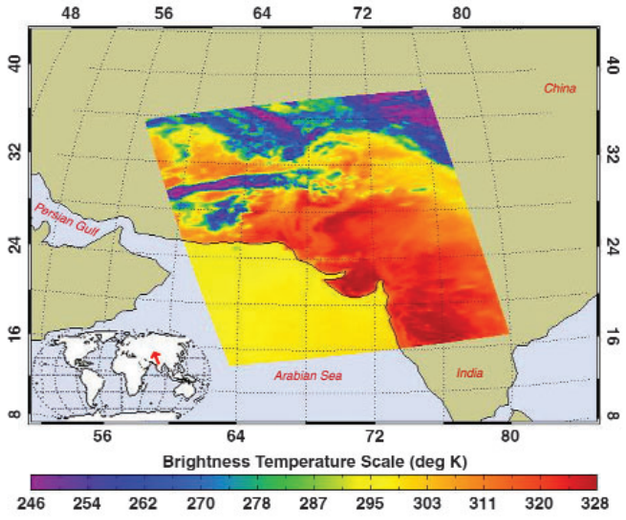
MODIS on Terra and Aqua

Resolution: 250 m, 500 m, and 1 km

Availability: Terra, February 2000 to present; Aqua, August 2002 to present

Coverage: Global

The Moderate Resolution Imaging Spectroradiometer (MODIS) acquires data in 36 discrete spectral bands between 0.4 and 14.5 μm. MODIS data almost completely cover the Earth in one day. MODIS's strength lies in its combination of high radiometric resolution and appropriate dynamic range, global coverage, and accurate calibration of visible and thermal IR bands for retrieving atmospheric, land, and sea surface properties. MODIS data are useful for long-term climate and global change studies, as well as for short-term monitoring of natural disasters. GES DAAC distributes Level 1 radiometric, geolocation, and higher level ocean and atmosphere products. MODIS data products are available from http://daac.gsfc.nasa.gov/MODIS/.



This AIRS Level 1B quick browse image, acquired April 1, 2003, displays brightness temperature inverted from observed radiance. The miniature global map indicates the geographic location of the granule and flight direction of the spacecraft. The visualizer adopts a single pseudo-satellite projection to minimize image distortion anywhere on the globe.

MODIS Airborne Simulator (MAS)

Resolution: 50 m at 20-km altitude

Availability: 1993 to present

Coverage: Aircraft data

MAS data are derived from a 50-channel radiometer on a NASA ER-2 high-altitude aircraft. The data help define, develop, and test algorithms for MODIS data. See http://daac.gsfc.nasa.gov/fieldexp/MAS.

Nimbus-7 CZCS

Resolution: Radiance measurements at 1 km and 4 km; pigment and chlorophyll concentrations and water-leaving radiances at 4 km and 20 km

Availability: November 1978 to June 1986

Coverage: Global

The Coastal Zone Color Scanner (CZCS) was a multispectral line scanner mainly devoted to measurements of ocean color. It had six spectral bands. CZCS Levels 1, 2, and 3 data products are available.

Pathfinder Advanced Very High Resolution Radiometer (AVHRR)

Resolution: 8 km

Availability: 1981 to 2001

Coverage: Global

AVHRR data contain daily and 10-day global composites of terrestrial Normalized Difference Vegetation Index (NDVI) and atmospherically corrected radiances produced with improved algorithms.

Sea-viewing Wide Field-of-view Sensor (SeaWiFS)

Resolution: Raw radiance data at 1 km; processed radiance and geophysical products at 4 km and 9 km

Availability: September 1997 to December 2003

Coverage: Local, regional, and global

SeaWiFS provides raw radiance data and processed orbital swath and global data products that include normalized water-leaving radiances, chlorophyll concentration, and atmospheric optical parameters.

Solar Radiation and Climate Experiment (SORCE)

Resolution: Full solar disk data at different spectral resolutions

Availability: January 2003 to present

Coverage: Full solar disk

SORCE carries four instruments: the Total Irradiance Monitor (TIM), the Solar Stellar Irradiance Comparison Experiment (SOLSTICE), the Spectral Irradiance Monitor (SIM), and the Extreme Ultraviolet Photometer System (XPS). SORCE data contain measurements of the incoming x-ray, UV, visible, near-infrared, and total solar radiation. See http://daac.gsfc.nasa.gov/upperatm/sorce/.

TIROS Operational Vertical Sounder (TOVS) Pathfinder

Resolution: 1 deg

Availability: 1978 to 1994

Coverage: Global

Data contain profiles of temperature, moisture, precipitation, cloudiness, and outgoing longwave radiation produced with improved algorithms.

Total Ozone Mapping Spectrometer (TOMS)

Resolution: 1 by 1.25 deg

Availability: Nimbus-7, November 1978 to May 1993; Meteor-3, August 1991 to December 1994; ADEOS, September 1996 to June 1997; EP, July 1996 to present

Coverage: Global

Data contain global column ozone amounts and UV reflectivity, and are available from the Nimbus-7 and Meteor-3 satellites and the Advanced Earth Observing System (ADEOS) and Earth Probe (EP) missions.

TOGA-COARE

Resolution: Varies with data set

Availability: November 1992 to February 1993

Coverage: Tropical Pacific

Tropical Ocean Global Atmosphere-Coupled Ocean Atmosphere Response Experiment (TOGA-COARE) data contain field observations of radiation, cloud, and precipitation parameters collected from surface-, aircraft-, and satellite-based instruments.

Tropical Rainfall Measuring Mission (TRMM)

Resolution: VIRS at 2.2 km; TMI at 5.0 km; PR at 4.0 km; Level 3 precipitation at 1 by 1 deg and 5 by 5 deg

Availability: December 1997 to present

Coverage: 40° N to 40° S global

TRMM products contain visible/infrared scanner (VIRS), TRMM Microwave Imager (TMI), and Precipitation Radar (PR) observations of tropical and subtropical rain systems and spatially and temporally resampled precipitation data. Data are available from http://lake.nascom.nasa.gov/data/dataset/TRMM/.

Upper Atmosphere Research Satellite (UARS)

Resolution: Most atmospheric products at a 4-deg interval along track; solar spectral data at 1 nm

Availability: September 1991 to September 2001

Coverage: Near global (80° N to 80° S)

The GES DAAC archives upper atmospheric data from nine UARS instruments (CLAES, HALOE, HRDI, ISAMS, MLS, PEM, SOLSTICE, SUSIM, and WINDII) and UARS correlative data. Data contain profiles of upper atmospheric chemical constituents, winds, solar irradiance, and energetic particle input. Products are available as time- and latitude-ordered data sets. See http://daac.gsfc.nasa.gov/upperatm/data.html.

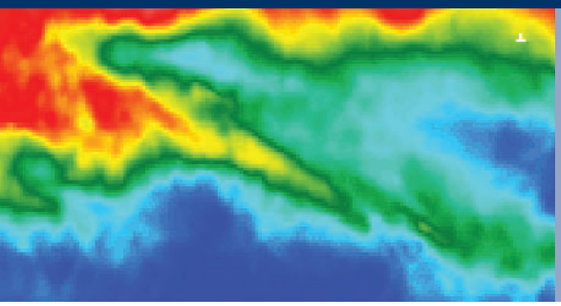
Data Access

Data can be ordered through the search-and-order system at http://daac.gsfc.nasa.gov/data. Access to GES DAAC data is also available through the EDG (see page 5-1).

For assistance or additional information, contact

GES DAAC User Services
Goddard Space Flight Center

Phone: +1 301–614–5224
U.S. Toll Free 1-877-422-1222
Fax: +1 301–614–5304
E-mail: gsfc@eos.nasa.gov *or*
help@daac.gsfc.nasa.gov
Web: http://daac.gsfc.nasa.gov



- Hydrologic Cycle
- Severe Weather Interactions
- Lightning
- Convection

The GHRC provides both historical and current Earth science data, information, and products from satellite, airborne, and surface-based instruments. The GHRC acquires basic data streams and produces derived products from many instruments spread across a variety of instrument platforms.

Available Data

Lightning Data Products

Space-based lightning observations are obtained from the Lightning Imaging Sensor (LIS), the Optical Transient Detector (OTD), and surface validation networks in the continental United States and Brazil.

LIS and OTD

Resolution: OTD, about 70 km; LIS, about 4 km

Availability: LIS, 1997 to present; OTD, 1995 to 2000

Coverage: OTD, 70° N to 70° S; LIS, 35° N to 35° S

The world's first space-based lightning sensors are capable of detecting and locating lightning events during day-and-night conditions with high-detection efficiency. The sensors are used to detect the full spectrum of lightning flashes, including cloud-to-ground, cloud-to-cloud, and intracloud lightning events.

Passive Microwave Data Products

Global hydrological parameters such as sea surface temperature, atmospheric water vapor, wind direction, and atmospheric temperature are derived from several passive microwave instruments on board the Tropical Rainfall Measuring Mission (TRMM), NOAA-15, NOAA-16, NOAA-17, and Special Sensor Microwave/Imager (SSM/I) Defense Meteorological Satellite Program (DMSP) F-8 through F-15 satellite series.

The GHRC is the host of the Passive Microwave Earth Science Information Partner (PM-ESIP), providing measurement of maximum tropical cyclone wind speeds, global tropospheric and atmospheric temperatures, and observations of tropical rainfall, sea surface temperature, and wind speed.

Global Tropospheric and Stratospheric Deep Layer Temperature Data

Resolution: 22 to 90 km

Availability: 1979 to present

Coverage: Global

Data are derived from the Advanced Microwave Sounding Unit (AMSU) and the Microwave Sounding Unit (MSU).

SSM/I

Resolution: Variable

Coverage: Global

Brightness temperatures, water vapor, wind speed, and ocean wind speed data products are available. The period of record is not complete for all parameters.

TRMM Microwave Imager (TMI)

Resolution: About 15 nautical miles at nadir

Availability: 1997 to present

Coverage: 35° N to 35° S

Data products include water vapor, cloud water, ocean wind speed, and sea surface temperatures.

Field Experiment Data Sets

Airborne Passive Microwave Radiometer (AMPR)

Resolution: 0.6 to 2.8 km at nadir

Availability: 1990 to 2001 for numerous field campaigns

Coverage: Field-campaign dependent

AMPR instrument data sets at 85, 37, 19, and 10 GHz were acquired on board the NASA ER-2 during the CAMEX-1, CAMEX-2, CAMEX-3, CAMEX-4, Texas and Florida Underflights (TEFLUN), First International Satellite Cloud Climatology Project (ISCCP) Regional Experiment-Arctic Cloud Experiment (FIRE-ACE), and Convection and Precipitation/Electrification Experiment (CaPE) field experiments.

Altus Cloud Electrification Study (ACES)

Resolution: Data set dependent

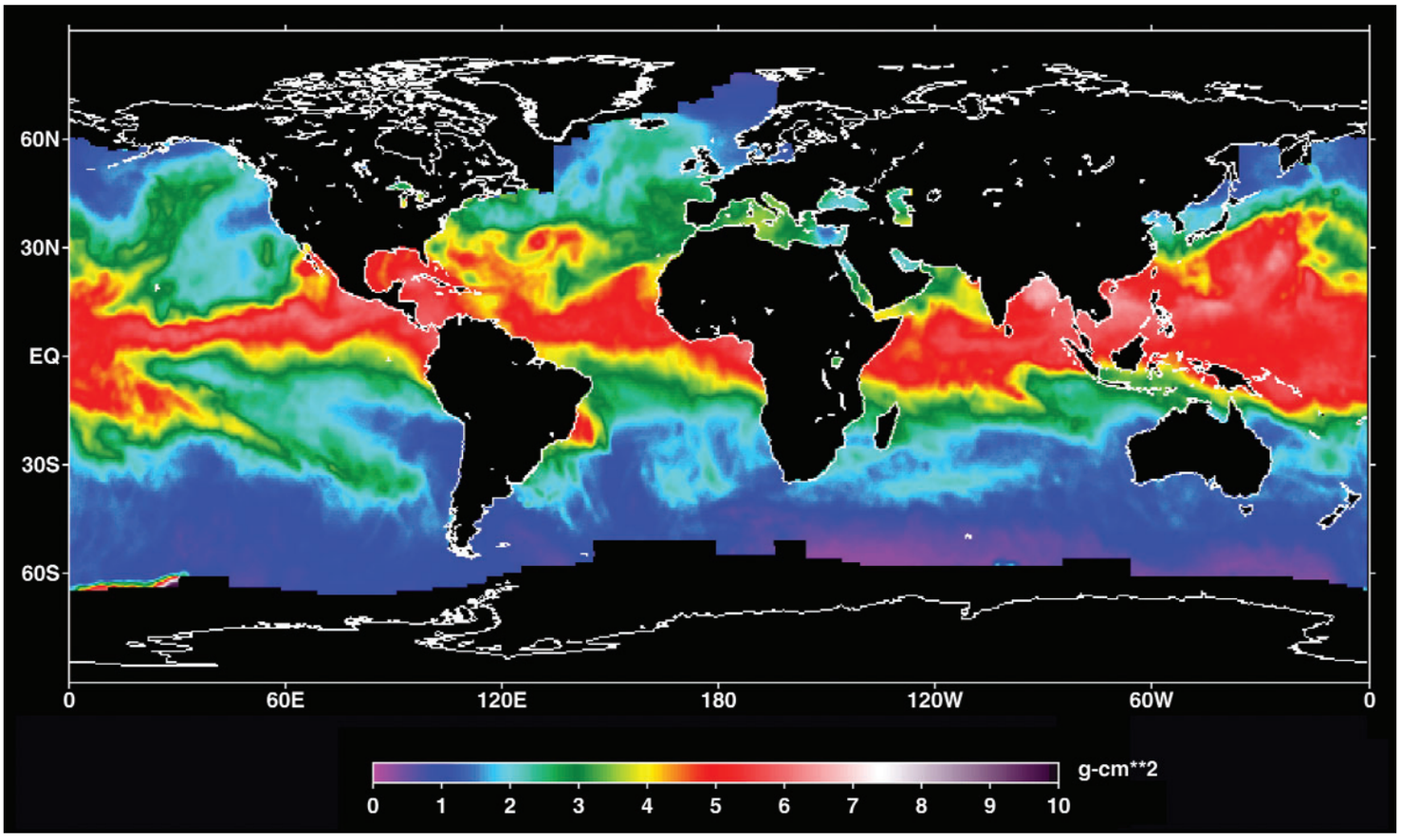
Availability: August 2002

Coverage: Southwestern Florida

Based out of the Key West Naval Air Facility in August 2002, ACES contributed important electrical and optical measurements not available from other sources. Making use of the Altus II uninhabited aerial vehicle (UAV), scientists collected several types of electrical data by flying over the tops of thunderstorms. Electric field, conductivity, and magnetic field properties were observed. For the first time, data for the entire life cycle of a thunderstorm were collected from the vantage point of the slow flying UAV that was able to remain above the storm for its entire life cycle. Along with ground-based observations, these data will advance the application of global space-based lightning measurements toward a better understanding of the Earth's electrical system. ACES data will be maintained at GHRC and should be available early 2004.

Convection and Moisture Experiment (CAMEX)

The CAMEX archive provides data from the CAMEX-3 and CAMEX-4 field experiments. These experiments produced high-resolution spatial and temporal information of hurricane structure, dynamics, and motion.



This composite atmospheric water vapor image was derived from data from the SSM/I instrument on board the F-15 satellite during September 19–23, 2002. Water vapor signatures of Hurricanes Kyle and Isadore are in the Atlantic Ocean and Gulf of Mexico, respectively. Kyle's high water vapor signature is in the central Atlantic, and Isadore's is over the western tip of Cuba. The other dominant signature is the belt of high water vapor throughout the tropical equator.

CAMEX-3

Resolution: Data set dependent

Availability: August to September 1998

Coverage: Western Atlantic, Caribbean, and Gulf of Mexico

CAMEX-3 is the third field campaign in the CAMEX series. CAMEX-3 holdings include hurricane research data sets derived from a variety of passive microwave, radar, infrared, visible, lidar, interferometer, electric field, and lightning instruments on board the NASA ER-2 and DC-8 aircraft, as well as surface station instruments on Andros Island, Bahamas.

CAMEX-4

Resolution: Data set dependent

Availability: August to September 2001

Coverage: Western Atlantic, Caribbean, and Gulf of Mexico

The fourth field campaign in the CAMEX series was based out of Jacksonville Naval Air Station, Florida, from August to September 2001. CAMEX-4 focused on the study of tropical cyclone (hurricane) development, tracking, intensification, and landfalling impacts using NASA-funded aircraft and surface remote sensing instrumentation. Through use of the NASA DC-8 and ER-2 aircraft along with the NOAA P-3 and (for the first time) Aerosonde (a small UAV), data were collected in the vicinity of several tropical storms and hurricanes. The experiments were designed to provide data that will allow scientists to better understand the dynamic nature of these dangerous storms.

Data Access

Most data are publicly available, although some restrictions apply for the distribution of commercially obtained data. Access to data, data search and order, and information about GHRC's data sets can be found at the Web site given below. Online data access is also available through the EDG (see page 5-1).

For assistance or additional information, contact

GHRC User Services
Global Hydrology and Climate Center

Phone: +1 256–961–7932
Fax: +1 256–961–7723
E-mail: ghrc@eos.nasa.gov *or*
userservices@nsstc.nasa.gov
Web: http://ghrc.msfc.nasa.gov

- Radiation Budget
- Clouds
- Aerosols
- Tropospheric Chemistry

The Langley DAAC supports more than 30 projects and has more than 300 archived data sets relating to radiation budget, clouds, aerosols, and tropospheric chemistry. These data sets were obtained from satellite measurements, field experiments, and modeled data products. A complete list of data sets is available on the Web at http://eosweb.larc.nasa.gov.

Available Data

Radiation Budget

Radiation budget data sets contain information related to the variability of total solar irradiance, top of atmosphere and surface radiation properties, effects of clouds on the energy budget, as well as data useful for solar energy technologies.

Availability: Varies by data set, from 1978 to present

Coverage: Global for most data

- Active Cavity Radiometer Irradiance Monitor (ACRIM) II and III
- Airborne Multi-angle Imaging SpectroRadiometer (AirMISR)
- ARM (Atmospheric Radiation Measurements) Enhanced Shortwave Experiment (ARESE)
- Convection And Moisture EXperiment (CAMEX) 4
- Clouds and the Earth's Radiant Energy System (CERES)
- Chesapeake Lighthouse and Aircraft Measurements for Satellites (CLAMS)
- Earth Radiation Budget Experiment (ERBE)
- Multi-angle Imaging SpectroRadiometer (MISR)
- Nimbus-7 Earth Radiation Budget (ERB)
- Sulfates/Smoke, Clouds, and Radiation (SCAR)
- Surface Radiation Budget (SRB)
- Surface Solar Energy (SSE)
- THe Observing-system Research and predictability experiment (THORpex)

Clouds

Cloud data sets contain information on the radiative properties of clouds; cirrus, marine stratus, and arctic cloud field studies; and subsonic aircraft effects on contrails and other cloud systems.

Availability: Varies by data set, from 1980 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- International Satellite Cloud Climatology Project (ISCCP)
- First ISCCP Regional Experiment (FIRE)
- SUbsonic aircraft: Contrail Cloud Effects Special Study (SUCCESS)

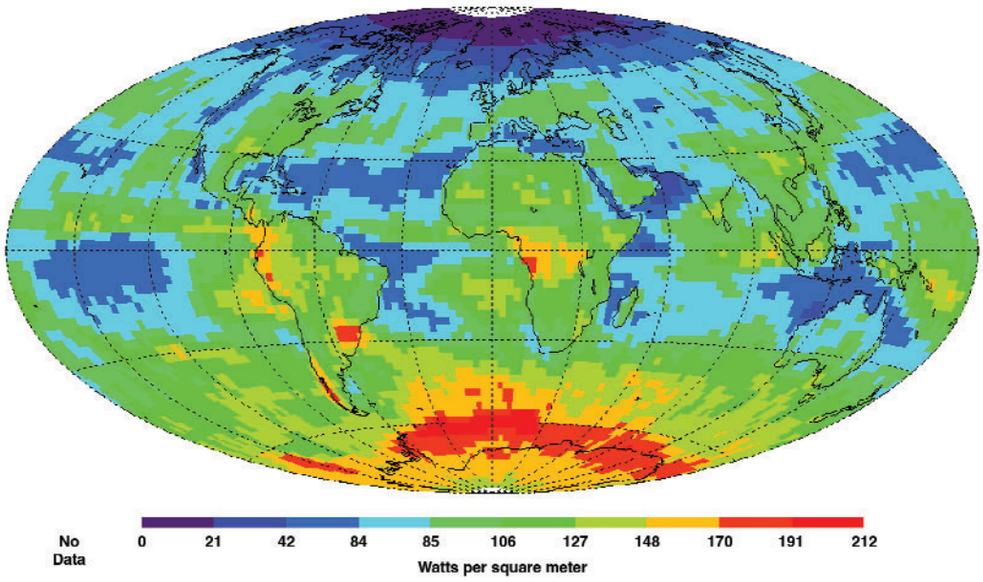
Aerosols

Aerosol data sets contain satellite- and lidar-derived information on the spatial and vertical distribution of stratospheric and tropospheric aerosols, as well as direct radiative impacts and chemical, physical, and optical properties of aerosols.

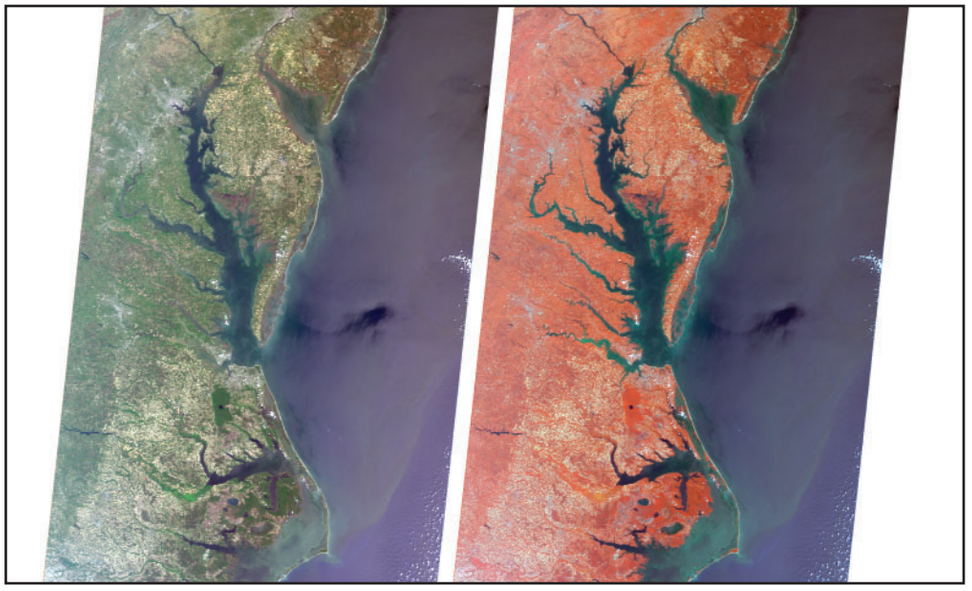
Availability: Varies by data set, from 1978 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- 48-inch Light Detection and Ranging (48" LIDAR) Aerosol Research Branch (ARB)
- Lidar Atmospheric Sensing Experiment (LASE)
- Lidar In Space Technology Experiment (LITE)
- Polar Ozone and Aerosol Measurement (POAM) II
- Stratospheric Aerosol and Gas Experiment (SAGE) I, II, and III
- Stratospheric Aerosol Measurement (SAM) II
- Tropospheric Aerosol Radiative Forcing Observational eXperiment (TARFOX)



This image shows total sky shortwave flux from the CERES ERBE-like Monthly Geographic Averages (ES-4) combined Terra/Aqua Edition 1 data for October 2002.



This view of the Chesapeake Bay and surrounding area was captured by MISR's nadir (AN) camera on April 24, 2002 (Orbit 12499, Path 14, Blocks 59–62). On the left is a true-color image, and on the right is a false-color image. Vegetation is shown in red in the false-color image. Waterways have similar representation in both images but are more evident in the false-color image. Major metropolitan areas such as Washington, DC, and Baltimore, MD, show prominently in both images.

Tropospheric Chemistry

Tropospheric chemistry includes geographic and temporal distribution of biomass burned, concentrations of key chemical species, and distribution and behavior of tropospheric carbon monoxide, ozone, and water vapor.

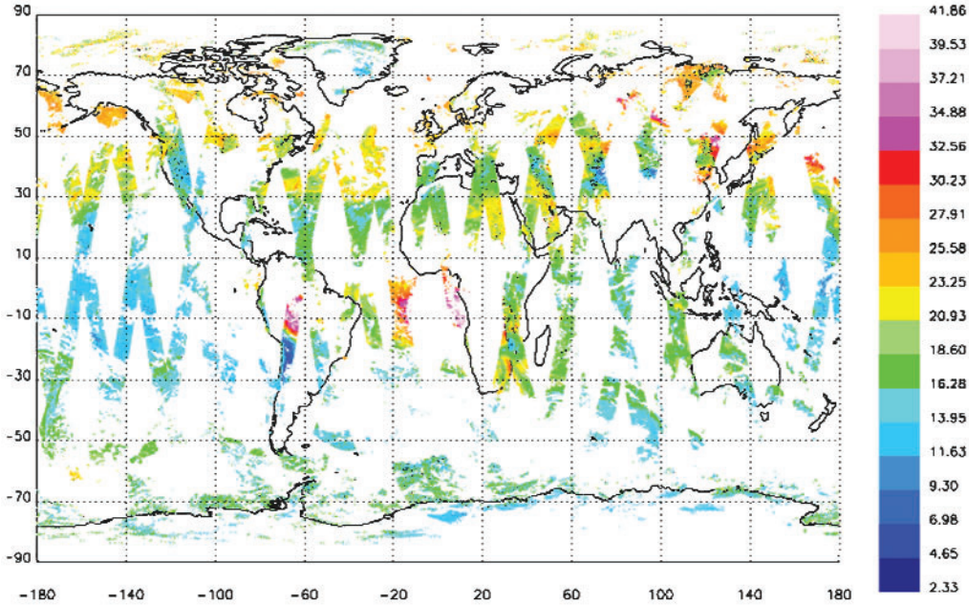
Availability: Varies by data set, from 1983 to present

Coverage: Ranges in spatial extent from field campaign to global coverage

- Biomass Burning
- Global Tropospheric Experiment (GTE)
- Measurement of Air Pollution from Satellites (MAPS)
- Measurements of Pollution In The Troposphere (MOPITT)
- NASA Water Vapor Project (NVAP)
- North American Research Strategy for Tropospheric Ozone (NARSTO)
- Special Sensor Microwave/Imager (SSM/I)

Future Data Sets

- Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO)
- Tropospheric Emission Spectrometer (TES)



This image shows carbon monoxide total column measurements from the MOPITT-derived carbon monoxide and methane Level 2 data for August 31, 2003.

Data Access

Access to data, data search and order, and information about the Langley Atmospheric Sciences Data Center is available at the Web site listed below. Online data access is also available through the EDG (see page 5-1).

For assistance or additional information, contact

Science, User, and Data Services
NASA Langley Research Center

Phone: +1 757-864-8656
Fax: +1 757-864-8807
E-mail: larc@eos.nasa.gov
Web: http://eosweb.larc.nasa.gov

LP DAAC Land Processes DAAC – USGS EROS Data Center

- Land Processes

The LP DAAC promotes interdisciplinary study and understanding of Earth's integrated systems by providing data for the investigation, characterization, and monitoring of biologic, geologic, hydrologic, ecologic, and related conditions and processes. The LP DAAC ingests, processes, distributes, and archives data for land-related EOS sensors.

Available Data

Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Products

Resolution: VNIR at 15 m; SWIR at 30 m; TIR at 90 m

Availability: March 2000 to present

Coverage: Global (on demand)

Of the instruments on board Terra, ASTER offers the highest resolution image data in visible and near-infrared (VNIR), shortwave infrared (SWIR), and thermal infrared (TIR) wavelengths. Routinely acquired data and data products generated include Level 1A reconstructed unprocessed instrument data and Level 1B registered radiance at the sensor data. Higher level products, which can be requested on demand, include brightness temperature, surface reflectance, decorrelation stretch, surface radiance, surface emissivity, surface kinetic temperature, polar cloud classification, and digital elevation models.

MODIS Products from Terra and Aqua

Resolution: 250 m, 500 m, and 1 km

Availability: Terra, February 2000 to present; Aqua, August 2002 to present

Coverage: Global

The Moderate Resolution Imaging Spectroradiometer (MODIS) provides an integrated tool for observing a variety of terrestrial, oceanic, and atmospheric features of the Earth. Data sets are Level 2 and higher and include surface reflectance, land surface temperature, vegetation indices, fire anomalies, leaf area index, bidirectional reflectance distribution function and albedo, land cover change, vegetation cover conversion, and net primary production.

Landsat 7 Enhanced Thematic Mapper Plus (ETM+) Products

Resolution: Multispectral at 30 m; panchromatic at 15 m; thermal at 60 m

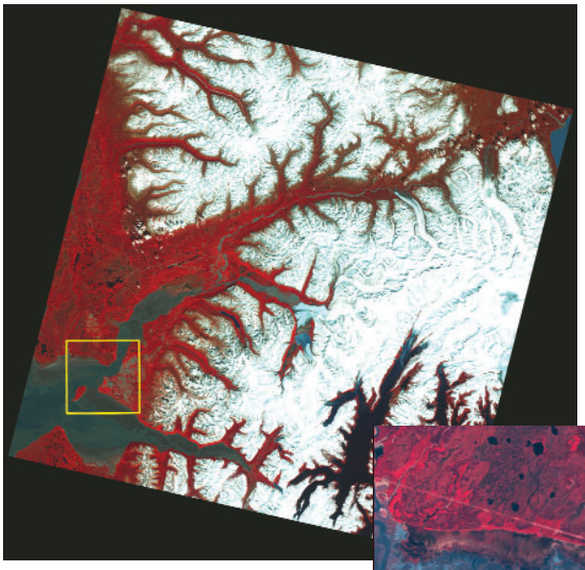
Availability: June 1999 to present

Coverage: Global

Landsat 7 ETM+ provides repetitive, synoptic coverage of continental surfaces; spectral bands in multispectral, panchromatic, and thermal regions of the electromagnetic spectrum; and absolute radiometric calibration. Landsat 7 promotes interdisciplinary research via synergism with other EOS observations, especially those orbiting in tandem with the Terra satellite, for near-coincident observations. The LP DAAC archives and distributes Level 0R formatted, Level 1 radiometric, and Level 1 geometric (i.e., systematic) products.

Future Data

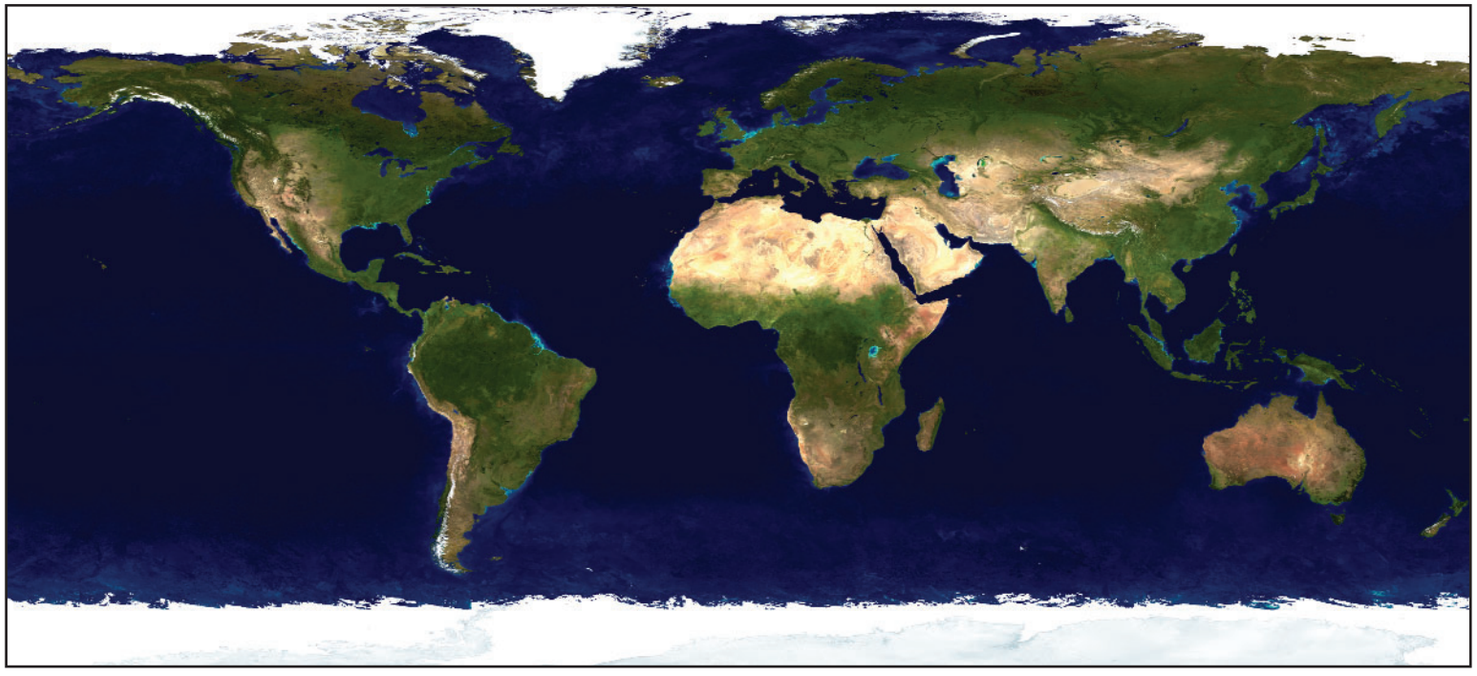
The LP DAAC will archive and distribute combined data products from the MODIS sensors on board the Terra and Aqua satellites. The first MODIS instrument was launched on board Terra on December 18, 1999. The



This Landsat 7 ETM+ false-color image (Path 68, Row 17) of Alaska, acquired on June 2, 2001, covers an area of 185 by 185 km. Red indicates healthy vegetation, and white represents snow cover on the southern part of the Alaska Range.

Anchorage (lower left of image) lies between the Knik Arm and Turnagain Arm of Cook Inlet.

The subset ETM+ image of the Anchorage area includes the Anchorage International Airport (center), Elmendorf Air Force Base (upper right), and Fire Island (lower left). Anchorage is home to 40 percent of the state's population and serves as the financial, communications, and transportation hub of Alaska.



This "blue marble" composite is the most detailed true-color image of the entire Earth to date. Much of the information came from one remote sensor—MODIS. This value-added surface reflectance image combines satellite-based observations of land surface, oceans, sea ice, and clouds into a seamless mosaic of every square kilometer of the planet. Land and coastal ocean portions were based on surface observations collected from June through September 2001, composited every 8 days to compensate for clouds. Ocean data comprise shallow water true-color and global ocean color data. Topographic shading was based on the GTOPO30 data set. MODIS and AVHRR observations of Antarctica were combined. (Credits: NASA GSFC, MODIS Land Group, MODIS Atmosphere Group, MODIS Ocean Group, USGS EROS Data Center, USGS Terrestrial Remote Sensing Flagstaff Field Center, DMSP).

second was launched May 4, 2002, on board Aqua. Operating on both platforms, MODIS instruments provide morning and afternoon views with global, near-daily repeat coverage, complementing the spectral, spatial, and temporal coverage of the other research instruments on board each platform. The future combined MODIS data products will represent a new and improved capability for terrestrial satellite remote sensing aimed at meeting the needs of global change research. MODIS standard data products will provide new and improved tools for moderate resolution land surface monitoring. The full potential of MODIS will be realized once a stable and well-calibrated time series of multispectral data has been established.

This false-color ASTER image of Athens, Greece, was acquired on October 30, 2001. The image band combination (3n, 2, and 1 in RGB) shows healthy vegetation in red and urban areas in light blue. Athens was chosen host city for the 2004 Olympic Games.

Data Access

Data can be ordered via the EDG (see page 5-1). Before ordering, users are encouraged to use the tutorial at http://LPDAAC.usgs.gov/tutorial/. Data are available by FTP or on a variety of media, including CD-ROM and DVD.

For assistance or additional information, contact

LP DAAC User Services
U.S. Geological Survey
EROS Data Center

Phone: +1 605-594-6116
U.S. Toll Free: 1-866-573-3222
Fax: +1 605-594-6963
E-mail: edc@eos.nasa.gov
Web: http://LPDAAC.usgs.gov

NSIDC DAAC National Snow and Ice Data Center DAAC

- Snow and Ice
- Cryosphere and Climate

The NSIDC DAAC provides data and information for snow and ice processes, particularly interactions among snow, ice, atmosphere, and ocean, in support of research in global change detection and model validation. NSIDC also provides general data and information services to the cryospheric and polar processes research community.

Available Data

Terra and Aqua Products

Snow and Sea Ice Extent from MODIS on Terra and Aqua

Resolution: Snow cover at 500 m and 0.5 deg; sea ice extent at 1 km

Availability: Terra, February 2000 to present; Aqua, May 2003 to present

Coverage: Global

NSIDC's holdings include several Moderate Resolution Imaging Spectroradiometer (MODIS) snow and sea ice extent products. These products consist of Level 2 swath data and Level 3 gridded composites.

Advanced Microwave Scanning Radiometer-EOS (AMSR-E) on Aqua

Resolution: 5 to 56 km

Availability: May 2002 to present

Coverage: Global

AMSR-E data include brightness temperatures, soil moisture, ocean products (water vapor, cloud liquid water, sea surface temperature), rain, snow, and sea ice in both swath and gridded formats.

Passive Microwave Products

Nimbus-7 SMMR and DMSP SSM/I

Resolution: 25 km

Availability: SMMR, 1978 to 1987; SSM/I, 1987 to present

Coverage: Polar regions

Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SMM/I) data include gridded brightness temperatures and sea ice type, extent, and concentration.

Near-Real-Time SSM/I EASE-Grid Daily Global Ice Concentration and Snow Extent

Resolution: 25 km

Availability: Previous 2 weeks

Coverage: Polar regions

Near-real-time maps are meant to provide a best estimate of current ice and snow conditions, based on information and algorithms available at the time the data were acquired.

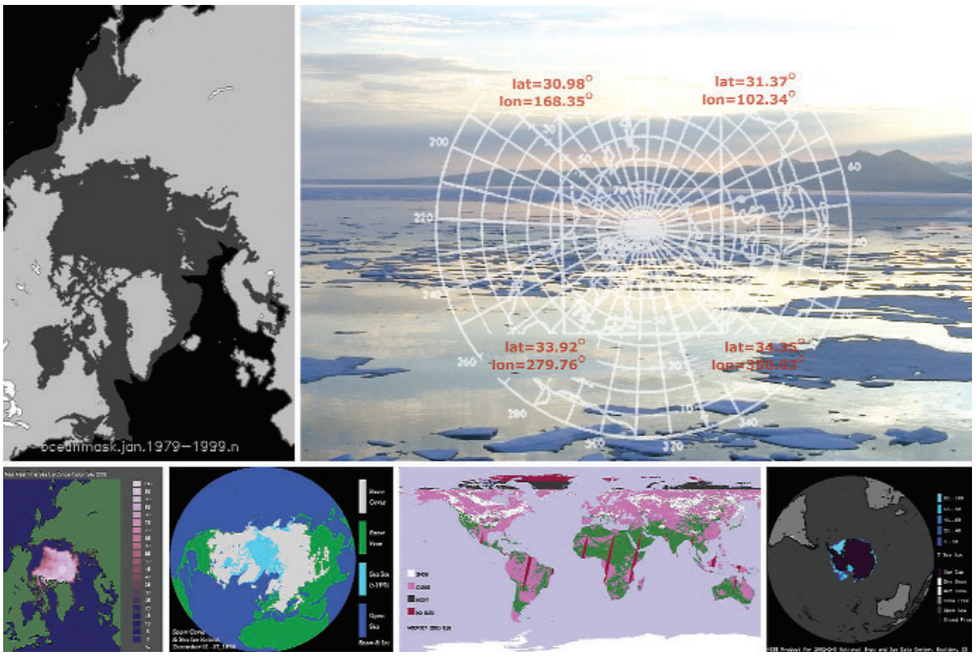
Northern Hemisphere EASE-Grid Weekly Snow Cover and Sea Ice Extent, Version 2

Resolution: 25 km

Availability: 1966 to 2001 and 1978 to 2001

Coverage: Northern Hemisphere

This data set combines snow cover and sea ice extent at weekly intervals for 1978 to June 2001, and snow cover alone for 1966 to June 2001.



Images clockwise from top left:

- *Sample Northern Hemisphere ocean mask, January 1979–99 (http://nsidc.org/data/docs/daac/nise1_nise.gd.html)*
- *Arctic pond inlet in Northwest Territory, Canada (stock photo), overlaid with a spatial coverage map of the Northern Hemisphere (http://nsidc.org/data/nsidc-0002.html)*
- *Southern Hemisphere NISE image for snow extent and sea ice concentration, February 3, 2002 (http://nsidc.org/data/docs/daac/nise1_nise.gd.html)*
- *MODIS climate-modeling grid browse image for February 8, 2003 (http://nsidc.org/data/modis/cmg_browse/index.html)*
- *Sample data record for snow cover and sea ice extent data for December 21–7, 1998 (This image is not available on the Web.)*
- *Sea ice concentration of the Northern Hemisphere, September 2002 (record low sea ice levels). (This image is from the data product at http://nsidc.org/data/g02135.html.)*

Sea Ice Ancillary Products

NSIDC distributes a host of ancillary sea ice products, including ice extent, melt onset data, climatologies, ice persistence, total ice-covered area, and ocean masks. See http://nsidc.org/data/smmr_ssmi_ancillary/.

AVHRR Products

AVHRR 1-km Level 1b Polar Data Set

Resolution: 1.1 km at nadir

Availability: 1992 to present

Coverage: Polar regions

This Advanced Very High Resolution Radiometer (AVHRR) data set provides nearly complete coverage of sea ice, land ice, and land in polar regions at 1.1-kilometer resolution for all five bands of the AVHRR sensor.

AVHRR Polar Pathfinder Twice-Daily EASE-Grid Composites

Resolution: 5 km and 25 km

Availability: 1981 to 2000

Coverage: Polar regions

These data sets are a collection of products for both poles, consisting of twice-daily gridded and calibrated satellite channel data and derived parameters. The parameters include average albedo and skin temperature, solar zenith angle, surface type mask, cloud mask, cloud fraction files, and others. Data are in 1-byte and 2-byte integer gridded format.

Altimetry and Elevation Data

Ice, Cloud, and Land Elevation Satellite (ICESat) Geoscience Laser Altimeter System (GLAS)

Resolution: 60-m spot size at nadir

Availability: March 12–20, 2003 (preliminary data at time of publication)

Coverage: Global, from 86° N to 86° S latitude

The main objective of the ICESat mission is to measure ice sheet elevations and changes in elevation through time. Secondary objectives include measurements of cloud and aerosol height profiles, land elevation, vegetation cover, and sea ice thickness.

RAMP Digital Elevation Model (DEM) Version 2

Resolution: 200 m, 400 m, and 1 km

Availability: Collected between 1940s and 2000

Coverage: Antarctica, from 60° S to 90° S latitude

This high-resolution RADARSAT Antarctic Mapping Project (RAMP) DEM combines topographic data from a variety of sources to provide consistent coverage of all of Antarctica.

RAMP AMM-1 SAR Image Mosaic of Antarctica

Resolution: 125 m to 1 km

Availability: 1997

Coverage: Antarctic continent

The RAMP First Antarctic Mapping Mission (AMM-1) mosaic provides a detailed look at ice sheet morphology, rock outcrops, research infrastructure, the coastline, and other features of Antarctica, as well as representing calibrated radar backscatter data that may provide insight into climatic processes affecting the upper few meters of snow cover.

Polar Atmospheric Data

Historical Arctic Rawinsonde Archive

Resolution: 100 km

Availability: About 1950 to 1996

Coverage: Poleward of 65° N

This CD-ROM collection contains millions of vertical soundings of temperature, pressure, humidity, and wind from Arctic land stations.

TOVS Pathfinder Path-P Daily Arctic Gridded Atmospheric Parameters

Resolution: 100 km

Availability: July 1979 to December 1998

Coverage: Northern Hemisphere

This data set has 14 gridded parameters, including atmospheric temperature, water vapor, skin surface temperature, cloud fraction, surface and cloud-top pressure, and emissivity.

Additional Products

The NSIDC DAAC and its host, the collocated National Snow and Ice Data Center, distribute data sets and products acquired outside EOSDIS. Data subjects include permafrost, frozen ground, glaciers, ice shelves, icebergs, ice sheets, snow cover, ice velocity, and ocean chemistry and temperature.

For more information, see NSIDC's Web site or contact the NSIDC User Services Office.

Data Tools

NSIDC distributes a variety of data manipulation tools for specific data types. It also has tools for searching, ordering, and subsetting gridded data. See http://nsidc.org/data/tools/ for more information.

Data Access

Data orders may be placed at the NSIDC DAAC through the EDG (see page 5-1).

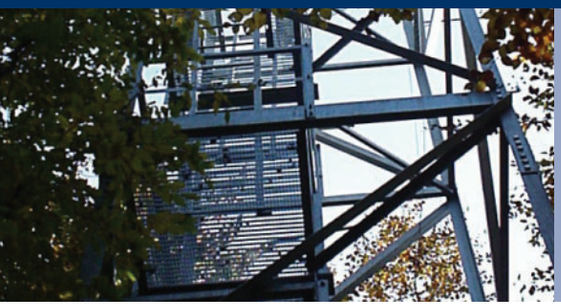
Users may also access information about NSIDC data holdings through the online data catalog on NSIDC's Web site. Depending on the data set, NSIDC data products are available on a variety of media, including FTP, CD-ROM, 8-mm tape, DVD, and DLT.

For assistance or additional information, contact

NSIDC DAAC User Services
National Snow and Ice Data Center
University of Colorado

Phone: +1 303–492–6199
Fax: +1 303–492–2468
E-mail: nsidc@eos.nasa.gov *or*
nsidc@nsidc.org
Web: http://nsidc.org

ORNL DAAC Oak Ridge National Laboratory DAAC



- Biogeochemical Dynamics
- Ecological Data
- Environmental Processes

The ORNL DAAC provides data and information about the dynamics between the biological, geological, and chemical components of the Earth's environment. These dynamics are influenced by interactions between organisms and their physical surroundings, including soils, sediments, water, and air.

Available Data

Field Campaign Data

Boreal Ecosystem-Atmosphere Study (BOREAS) and BOREAS Follow-On

Availability: Campaign data, 1993 to 1996 and 1993 to 1998; historical background data as early as 1937

Coverage: A 1,000- by 1,000-km study area with two sites in Manitoba and Saskatchewan, Canada

Through remote sensing and field measurements, BOREAS investigated exchanges of energy, water, heat, carbon dioxide, and trace gases between a boreal forest and the atmosphere.

First ISLSCP Field Experiment (FIFE) and FIFE Follow-On

Availability: Campaign data, 1987 to 1989 and 1987 to 1993; historical background data as early as 1858

Coverage: A 15- by 15-km study area in Kansas, U.S.A.

As part of the International Satellite Land Surface Climatology Project (ISLSCP), FIFE characterized exchanges of radiation, moisture, and carbon dioxide between a prairie site and the atmosphere.

Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA)

Availability: Background data, 1972 to 1996

Coverage: Map and site data in the Amazon Basin

LBA data include gridded measurements of precipitation in Bolivia, Brazil, and Peru and Synthetic Aperture Radar (SAR) imagery from the rain forest region during 1995 and 1996.

Oregon Transect Ecosystem Research (OTTER)

Availability: Campaign data, 1989 to 1991; background data, 1989 to 1991

Coverage: Six sites in Oregon, U.S.A.

The OTTER project estimated fluxes of carbon, nitrogen, and water in three Oregon forests, using an ecosystem-process model and remote sensing data.

Southern African Regional Science Initiative (SAFARI 2000)

Availability: Campaign data, 2000; historical background data, 1879 to 2001

Coverage: Southern Africa, 5° W to 60° E, 5° N to 35° S

SAFARI 2000 studied the linkages between land and atmosphere processes in southern Africa, especially the relationship of biogenic, pyrogenic, and anthropogenic emissions and the functioning of the biogeophysical and biogeochemical systems.

Superior National Forest (SNF)

Availability: Campaign data, 1983 to 1984; weather data, 1972 to 1990

Coverage: 50- by 50-km study area in northern Minnesota, U.S.A.

SNF research investigated the usefulness of remote sensing data in estimating the biophysical properties (e.g., biomass) of a boreal forest.

Land Validation Data

Accelerated Canopy Chemistry Program (ACCP)

Availability: Campaign data, 1992 to 1993

Coverage: Sites in the continental U.S.A.

ACCP used remote sensing to study the nitrogen and lignin content of the vegetation canopy in various ecosystems.

EOS Land Validation

Availability: Campaign data, 1999 to present

Coverage: Global

The EOS Land Validation project is using the ORNL DAAC's Mercury system for registering data sets from ground-based and airborne measurements to compare with EOS satellite products.

Global Flux Tower Network ("FLUXNET")

Availability: Campaign data, 1990 to present

Coverage: Global

FLUXNET is compiling measurements of radiation, water vapor, carbon dioxide, and trace gas fluxes provided by regional networks and independent sites. Flux data are used to understand the mechanisms controlling the exchanges of carbon dioxide, water vapor, and energy across a spectrum of temporal and spatial scales to compare to EOS satellite products.

MODIS ASCII Subsets

Availability: Collection 3, November 2000 to December 2002; Collection 4, March 2003 to present

Coverage: Global

Three MODIS land products from Collection 3 are available for 25 sites, as well as land cover products for 255 sites. Seven MODIS land products from Collection 4 are available for 274 sites. The products are subset for a 7- by 7-km area around the field sites. MODIS data are in Integerized Sinusoidal (ISIN) (Collection 3) or Sinusoidal (SIN) (Collection 4) projections in ASCII format. See http://www.fluxnet.ornl.gov/fluxnet/modis.cfm.

Prototype Validation Exercise (PROVE)

Availability: 1997

Coverage: Jornada Experimental Range near Las Cruces, New Mexico, U.S.A.

PROVE collected land and atmospheric measurements to develop methods for validating satellite data. Measurements include surface reflectance, surface temperature, albedo, and leaf area index.

Regional and Global Data

Climate Collections

Availability: Varies, between 1753 and 1999

Coverage: Global

Data were measured or estimated for grid cells of various sizes. Holdings include historical climatology, mean climatology, and precipitation.

Hydroclimatology Collections

Availability: 1874 to 1988

Coverage: U.S.A. and U.S. territories

Hydroclimatic characteristics (e.g., streamflow, wetlands, precipitation, temperature) were measured at various sampling sites.

Net Primary Productivity (NPP)

Availability: Varies, between 1930 and 2001

Coverage: Global

NPP holdings contain field measurements and NPP estimates for a variety of ecosystems.

River Discharge (RivDIS)

Availability: Varies, between 1807 and 1991

Coverage: Global

Holdings contain long-term monthly averaged values for river discharge measured at various stations.

Soil Collections

Availability: Varies, between 1940 and 1996

Coverage: Global

Soil characteristics were measured at sampling sites or estimated for grids of various sizes.

Vegetation Collections

Availability: Varies, between 1932 and 2000

Coverage: Global and regional

Holdings pertain to vegetation characteristics, including the distribution of vegetation types, as well as leaf area index calculated from field measurements.

Vegetation/Ecosystem Modeling and Analysis Project (VEMAP)

Availability: Climate measurements, 1895 to 1993; climate scenarios, 1994 to 2100

Coverage: U.S.A.

VEMAP studied the global response of biogeography and biogeochemistry to variability in climate and other environmental factors (e.g., elevated atmospheric carbon dioxide concentrations).

Data Services

The ORNL DAAC Web site provides links to data centers that offer regional and global environmental data. See http://daac.ornl.gov/daacpages/rgd_list.html.

Users can also search the ORNL Mercury system to locate regional and global data held by other data centers. See http://mercury.ornl.gov/ornldaac.

A flux tower in the Hesse Forest in eastern France. Networks of such towers around the world measure fluxes of radiation, water vapor, carbon dioxide, and trace gases to understand energy and gas exchange. Flux data are also used to validate EOS satellite products. The data are available through the FLUXNET project at the ORNL DAAC. The tower here was installed by the Eiffel Society.

Data Access

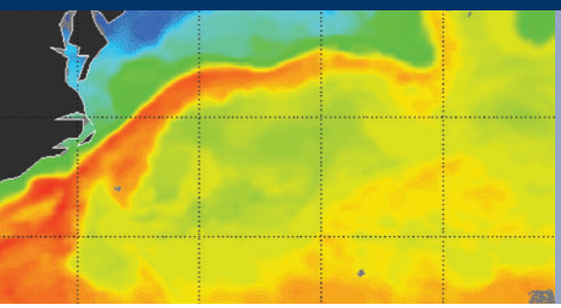
ORNL DAAC data are available through an online search-and-order system at www.daac.ornl.gov and through the EDG (see page 5-1).

For assistance or additional information, contact

ORNL DAAC User Services
Oak Ridge National Laboratory

Phone: +1 865–241–3952
Fax: +1 865–574–4665
E-mail: ornl@eos.nasa.gov *or*
ornldaac@ornl.gov
Web: http://www.daac.ornl.gov/

PO.DAAC Physical Oceanography DAAC – Jet Propulsion Laboratory



- Oceanic Processes
- Air-Sea Interactions

The PO.DAAC provides global oceanographic data from spaceborne instruments, and produces higher level data products. Core holdings include ocean surface topography, ocean winds, and sea surface temperatures. Other holdings include data on ocean wave height, ionospheric electron content, atmospheric moisture, and heat flux, as well as in situ data related to the satellite data.

Available Data

Ocean Surface Topography (OST)

TOPEX/POSEIDON

Resolution: Along track

Availability: 1992 to present

Coverage: Global

Data include sea surface height (SSH), wind speed, significant wave height, tropospheric water vapor, ionospheric electron content, and ancillary information along the satellite's track, from both NASA and CNES (French space agency) altimeters and radiometer. Products include the complete Merged Geophysical Data Record-B (MGDR-B), two reduced-volume sea surface height anomaly (SSHA) products, as well as near-real-time SSHA data from PO.DAAC's Near-Real-Time Image Distribution Server (NEREIDS).

Jason-1

Resolution: Along track

Availability: 2002 to present

Coverage: Global

Jason-1, the TOPEX/POSEIDON follow-on, is a joint French/U.S. mission to measure global sea surface topography along a 10-day repeat ground track. Data products include Operational Sensor Data Records (OSDRs), Interim Geophysical Data Records (IGDRs), Geophysical Data Records (GDRs), and SSHA products, as well as near-real-time SSHA data from NEREIDS.

Ocean Vector Winds

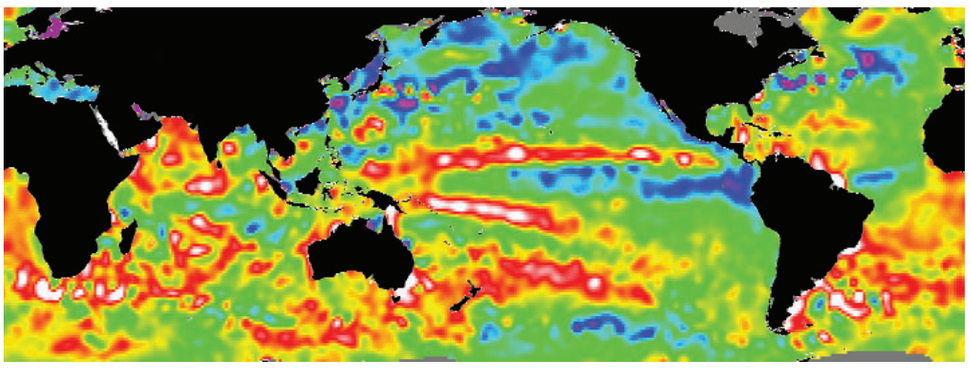
SeaWinds on QuikSCAT and SeaWinds on ADEOS-II

Resolution: Level 3 at 0.25 deg; Level 2B at 25 km

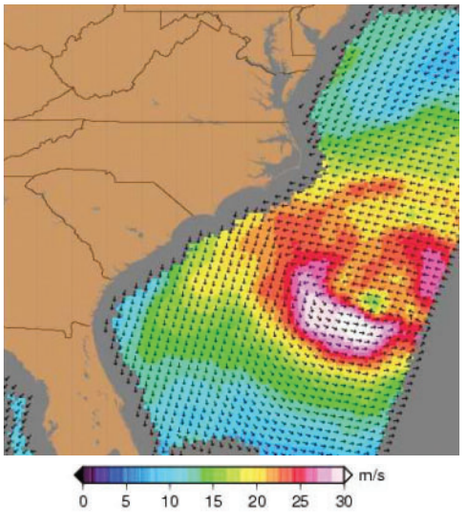
Availability: QuikSCAT, July 1999 to present; ADEOS-II, April 2003 to October 2003

Coverage: Global

The SeaWinds on QuikSCAT and SeaWinds on the Advanced Earth Observing Satellite II (ADEOS-II) Level 3 data sets provide daily gridded wind vectors, separated into zonal and meridional components. The Level 2B data sets provide per-orbit, swathed wind vectors, separated into speed and direction. SeaWinds orbits more than 14 times a day. Both products have ancillary data, e.g., rain flags.



Global SSHA data from the Jason-1 and TOPEX/POSEIDON tandem mission. Purple and blue represent below normal SSH, while green represents average SSH. Red and white indicate SSH more than 10 centimeters above normal.



View of Hurricane Isabel off the southeastern coast of the United States on September 18, 2003. The QuikSCAT ocean vector winds image was obtained from PO.DAAC's online tool NEREIDS.

SeaWinds Wind Stress

Resolution: Level 3 at 0.25 deg; Level 2B at 0.5 deg

Availability: QuikSCAT, July 1999 to present; ADEOS-II, April 2003 to October 2003

Coverage: Global

The SeaWinds Level 3 and Level 2B wind stress products are derived from the Level 3 and the Level 2B wind vector products, respectively. Both products contain wind stress and drag coefficients from two algorithms, Liu & Tang and Large & Pond.

NSCAT

Resolution: Level 2 at 25 km and 50 km; Level 3 at 0.5 deg

Availability: September 1996 to June 1997

Coverage: Global

This NASA scatterometer data product includes 25-kilometer wind vectors in native format (Level 2), daily 0.5- by 0.5-degree maps of selected wind vectors (Level 3), and 50-kilometer swath data.

Sea Surface Temperature (SST)

AVHRR Pathfinder SST

Resolution: 9 km, 18 km, and 54 km

Availability: 1985 to present

Coverage: Global

SST data are processed with the AVHRR Oceans Pathfinder algorithm. "Best" and "all-pixel" SST data are available as daily, 8-day, and monthly averages. Two quality-controlled climatology products are available at 5-day (pentad) and monthly resolutions.

AVHRR MCSST

Resolution: 2.2 km, 9 km, and 18 km

Availability: 1981 to 2001 (Miami) and 2001 to present (NAVOCEANO)

Coverage: Global

Available products include AVHRR Multi-Channel Sea Surface Temperature (MCSST) data using algorithms from the University of Miami and the Naval Oceanographic Office (NAVOCEANO). The NAVOCEANO products include climatologies. The 2.2-kilometer product is available in near real time for defined regional areas.

MODIS

Resolution: 4.63 km, 36 km, and 1.0 deg

Availability: October 2000 to present

Coverage: Global

Daily, weekly, and monthly SST data from the Moderate Resolution Imaging Spectroradiometer (MODIS) on board Terra and Aqua are available in thermal IR or mid-IR mapped products.

GOES

Resolution: 6 km

Availability: May 2003 to present

Coverage: 180–30° W; 45° S to 60° N

SSTs are derived from NOAA's Geostationary Operational Environmental Satellite (GOES) data and obtained at a near-real-time rate as 1-, 3-, and 24-hour images.

NCEP Reynolds Data Sets

Resolution: 2.0 and 1.0 deg

Availability: 1950 to 1998; 1981 to present

Coverage: Global

Two SST analyses are available: a reconstructed 2-degree in situ product from 1950 to 1998, and a 1-degree optimally interpolated AVHRR/in situ combined product from 1981 to the present.

Scatterometer Sigma0 Measurements

The normalized radar cross-section (i.e. sigma0) measured by scatterometers convert to winds when gathered over the oceans. Sigma0s have proven useful in a variety of land and ice studies. Enhanced-resolution sigma0 products are available for ERS, NSCAT, and Seasat, and a browse product is available for QuikSCAT.

Multiparameter and In Situ Data Products

In addition to the SSH, SST, and ocean wind products described, other in situ and multiparameter products are available, including significant wave height, chlorophyll-a concentration, near-surface currents, atmospheric moisture, brightness temperature, and heat flux. Refer to the PO.DAAC online catalog for a full listing of these products.

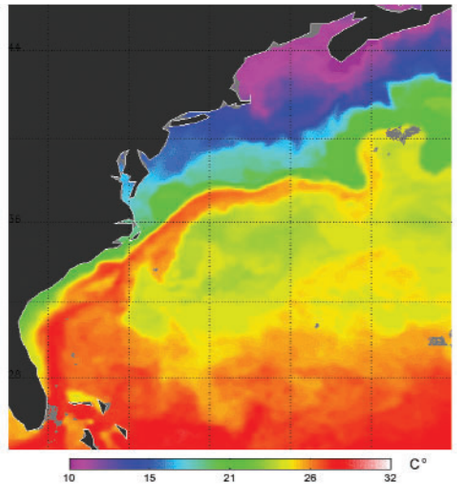
Data Tools and Services

PO.DAAC Ocean ESIP Tool (POET)

Data subsetting and visualization are available from the POET Web-based interface. Output is returned as a latitude-longitude map, animation, time-series graph, or space-time profile. Files can be downloaded in formats such as ASCII, image (GIF, JPG, PNG), scientific (HDF, netCDF), GIS (GeoTIFF, ArcGrid), or binary. This graphical user interface was developed by the Ocean ESIP (Earth Science Information Partner).

PO.DAAC Near-Real-Time Image Distribution Server (NEREIDS)

This server provides sea surface temperature, ocean surface topography, ocean vector winds, and land and sea ice satellite browse images within a few hours of capture. Binary data files are available for some images. Satellite missions include NOAA AVHRR, TOPEX/POSEIDON, Jason-1, and SeaWinds on QuikSCAT.



Gulf Stream MCSST off the eastern coast of the United States. MCSST 2.2-kilometer data are provided by NAVOCEANO.

Future Products

Future products include data from the Gravity Recovery and Climate Experiment (GRACE) mission, ocean model products through POET, and long-term Climate Data Records (CDRs). CDRs will be distributed for TOPEX/POSEIDON/Jason-1 SSHAs, QuikSCAT and ADEOS-II ocean vector winds, and AVHRR Pathfinder SST.

Data Access

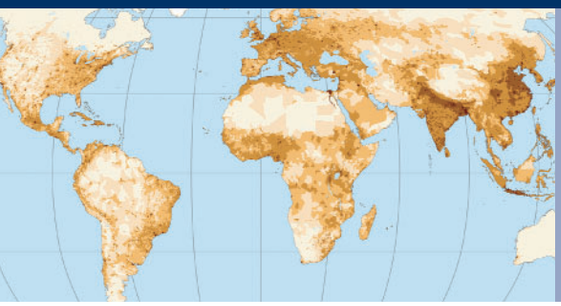
The PO.DAAC catalog of products and educational information can be accessed through the Web site. Investigators may subscribe to the PO.DAAC data-news bulletins. An online search-and-order service is also available through the EDG (see page 5-1).

For assistance or additional information, contact

PO.DAAC User Services
Jet Propulsion Laboratory

Phone: +1 626–744–5508
Fax: +1 626–744–5506
E-mail: jpl@eos.nasa.gov *or*
podaac@podaac.jpl.nasa.gov
Web: http://podaac.jpl.nasa.gov
FTP: podaac.jpl.nasa.gov

SEDAC Socioeconomic Data and Applications Center



- Population
- Sustainability
- Geospatial Data
- Multilateral Environmental Agreements

SEDAC is operated by the Center for International Earth Science Information Network (CIESIN), a unit of the Earth Institute at Columbia University based at Lamont-Doherty Earth Observatory in Palisades, New York. SEDAC's missions are to synthesize Earth science and socioeconomic data and information in ways useful to a wide range of decision makers and other applied users, and to provide an "Information Gateway" between the socioeconomic and Earth science data and information domains.

Available Data

Gridded Population of the World (GPW)

Resolution: 2.5-arc-minute grid

Availability: 1990, 1995, and 2000

Coverage: Global, continental, and national

In the GPW data set, the distribution of human population is converted from national or subnational units to a series of georeferenced quadrilateral grids. Land area, population counts, and densities for each 2.5-arc-minute grid cell are available for the globe and six continental regions. Also, land data and population counts are available for each country. GPW raster (grid) data are available via FTP in three formats: ASCII text, ArcInfo interchange files (.e00), and binary band interleaved by line (BIL). See http://sedac.ciesin.columbia.edu/gpw.

Population, Landscape, and Climate Estimates (PLACE)

Resolution: National

Availability: 1995

Coverage: Global

The PLACE data set is part of SEDAC's National Aggregates of Geospatial Data collection. In this data set, population and territorial extent are overlaid with biophysical parameters such as biome, climate, coastal proximity, elevation, population density, and slope. The resulting data set consists of an estimate of population and area (expressed as counts and percentages) for each of these parameters and is usable by researchers who require tabular data aggregated to the national level. The data are available via FTP in three formats: Excel, SPSS, and SAS. See http://sedac.ciesin.columbia.edu/plue/nagd/place.html.

Georeferenced Population Data Sets of Mexico

Resolution: Includes a 1-km gridded population data set

Availability: Includes urban population change for 1921 through 1990

Coverage: State and municipio levels

This collection includes Geographic Information System (GIS) and time-series data on Mexico's population, including a 1-kilometer gridded population data set and a time series of urban population change for 1921 through 1990. Data files in ArcInfo export format are available via FTP. See http://sedac.ciesin.columbia.edu/home-page/mexico.html.

Potential Impacts of Climate Change on World Food Supply: Data Sets from a Major Crop Modeling Study

Resolution: National

Coverage: Global

This site provides access to data on projected crop yield changes for major world regions based on climate model estimates, increased atmospheric carbon dioxide concentrations, and alternative adaptation scenarios. Extensive information is provided on the study's methodology, inputs, and limitations, and on related links. See http://sedac.ciesin.columbia.edu/giss_crop_study/index.html.

China Dimensions Data Collection

Resolution: Includes administrative regions of China at 1:1,000,000

Availability: Varies by data set, from 1949 to 2000

Coverage: National, provincial, and county levels

China Dimensions is a rich collection of data resources for the People's Republic of China. Highlights include digital administrative boundaries, fundamental GIS layers, and county-level data on population, agriculture, economics, and hospitals. See http://sedac.ciesin.columbia.edu/china.

Central American Vegetation/Land Cover Classification and Conservation Status

Resolution: Subnational

Coverage: Central America

This report assesses the degree to which both existing and proposed terrestrial protected area networks protect or would protect landscape-level biodiversity, which is represented as vegetation types delineated from remotely sensed imagery. A comprehensive, standardized, and thematically appropriate map of Central American vegetation and land cover types was developed by classifying Advanced Very High Resolution Radiometer (AVHRR) imagery (1-square-kilometer resolution) using advanced digital image processing routines and expertise provided by the Central America Vegetation Working Group. The map identifies 17 remaining natural vegetation types. The classification accuracy of the map is estimated to exceed 80 percent. Access ftp://ftp.ciesin.columbia.edu/pub/data/conservation/PROARCA/.

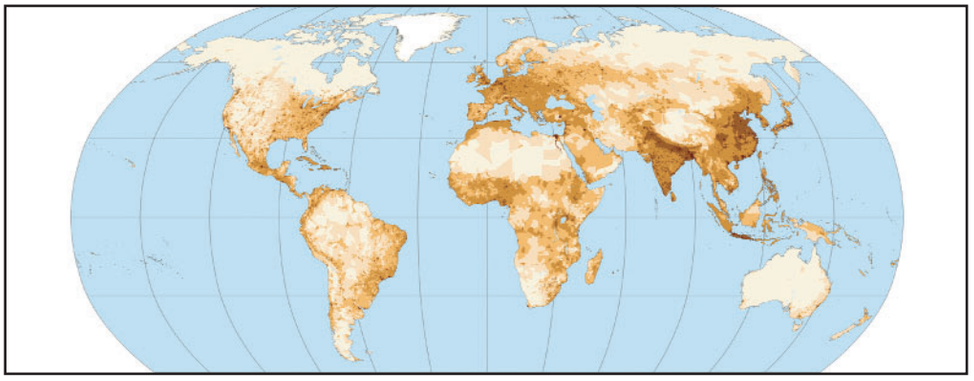
Environmental Sustainability Index (ESI)

Resolution: National

Availability: 2000 to 2002

Coverage: Global

The ESI is a measure of overall progress toward environmental sustainability; it was developed for 142 countries. ESI scores are based upon a set of 20 core "indicators," each of which combines 2 to 8 variables for a total



Gridded Population of the World provides estimates of human population density for each 2.5-arc-minute quadrilateral for the year 2000.

of 68 underlying variables. The ESI permits cross-national comparisons of environmental progress in a systematic and quantitative fashion. This index represents a first step toward a more analytically driven approach to environmental decision making. See http://www.ciesin.columbia.edu/indicators/ESI/index.html.

Other Services

Assessments of Impacts and Adaptations to Climate Change (AIACC) in Multiple Regions and Sectors

The AIACC Web site facilitates access to extensive data, software, and bibliographic resources related to climate impacts, adaptation, and vulnerability across multiple sectors. The Data, Methods, and Synthesis Activity is part of the AIACC Program. The Web site synthesizes information on the sectors, systems, and groups studied; methods utilized; and key results of the 24 AIACC projects. See http://sedac.ciesin.columbia.edu/aiacc/.

U.S.-Mexico Demographic Data Viewer

This application provides rapid, interactive data mapping, viewing, and analysis of more than 200 socioeconomic variables that are congruent between the United States and Mexico. The U.S.-Mexico DDViewer is a useful tool for browsing and visualizing patterns at geographic levels ranging from regions to counties/municipios. This tool may be used to create customized maps of population, health, and other socioeconomic characteristics using a Java-enabled Internet browser. See http://plue.sedac.ciesin.org/plue/ddviewer/ddv30-USMEX/.

Special Report on Emissions Scenarios

Forty scenarios of future greenhouse gas emissions were prepared by the Working Group III of the Intergovernmental Panel on Climate Change. The scenarios can assist in climate change analysis, including climate modeling and assessment of impacts, adaptation, and mitigation. See http://sres.ciesin.columbia.edu/.

Environmental Treaties and Resource Indicators (ENTRI)

ENTRI is a searchable relational database that contains international environmental treaties, treaty summaries, treaty status files, and global natural resource indicator data. See http://sedac.ciesin.columbia.edu/entri.

Thematic Guides on the Human Dimensions of Global Environmental Change

Thematic Guides offer overviews of some of the key topics and issues that pertain to human interactions in the environment and global change. It is a tool that allows researchers, policy makers, educators, and the public to quickly access background materials on key global change issues, and to locate key data sets and information resources. See http://sedac.ciesin.columbia.edu/tg/guide_main.jsp.

- ***Social Science Applications of Remote Sensing*** provides an introduction to remote sensing for nontechnical audiences and reviews key issues in the application of remote sensing techniques in social science research.
- ***Land-Use and Land-Cover Change*** presents the latest understanding on changes in land use and land cover, a key area of global change research.
- ***Global Population Projections*** helps researchers and educators to better understand how projections are produced and to choose the best set of projections for their needs.

Ramsar Wetlands Data Gateway

The Ramsar Wetlands Data Gateway provides access to data relevant to the Wetlands of International Importance listed under the auspices of the Ramsar Convention. It includes database query interfaces and a Web-mapping tool. See http://sedac.ciesin.columbia.edu/ramsardg/.

Urban Remote Sensing Studies Web Page

This page groups together SEDAC-sponsored publications and reports that focus on remote sensing applications in urban areas, and provides links to other useful resources. See http://sedac.ciesin.columbia.edu/urban_rs/.

Data Access

SEDAC Data and Information Catalog Services

SEDAC has developed an electronic gateway to provide access to the catalogs of a diverse international group of data archives and other institutions. The distributed search interface is available at http://www.gateway.ciesin.columbia.edu.

For assistance or additional information, contact

SEDAC User Services
CIESIN at Columbia University
Phone: +1 845–365–8920
Fax: +1 845–365–8922
E-mail: sedac@eos.nasa.gov *or*
ciesin.info@ciesin.columbia.edu
Web: http://sedac.ciesin.columbia.edu

Section 5

EOS Data Gateway (EDG)

The EDG is the primary access point to EOSDIS and other ESE data holdings archived at the DAAC Alliance data centers and several international data centers. The goal of the EDG is to provide seamless, online access to these archives.

The EDG search-and-order tool provides access to more than 1,800 data sets held at 23 data centers. This system allows users, including those without specific knowledge of the data, to search science data holdings, retrieve high-level descriptions of data sets and detailed descriptions of the data inventory, view browse images, and place orders for data products. This system is accessible on the Web. See http://eos.nasa.gov/imswelcome.

The EDG search-and-order tool has the following features:

- ***Guide documentation***—Enables the user to search the archive centers online document servers for information on data sets, platforms, instruments, etc., associated with the cataloged data.
- ***HDF tools access***—Provides easy access to HDF and HDF-EOS data-handling tools.
- ***Browse capability***—Allows a user to explore the list of data sets or granules returned by a search by viewing their temporal coverage, spatial coverage, attributes (metadata), related documents (guide search), and browse images.
- ***Order function***—Allows the user to select data for ordering, choose packaging information, enter ordering information (such as shipping address), and place an order.

DAAC Data Search and Order

The DAAC Alliance is responsible for data archival, product development and distribution, and user support. Member data centers are distinguished from one another by their specific Earth science disciplines. In addition to the search-and-order capabilities provided by the EDG, the data centers have individual online systems that allow them to provide unique services for users of a particular type of data. The center-specific systems emphasize data products, services, and data-handling tools unique to the data center.

The DAAC Alliance data centers provide their users with the following services and information:

- ***Data center services***
  - Center-unique search-and-order systems
  - Specific Earth science discipline searches
  - Specialized data set tools
- ***User services***
  - Assistance in selecting and obtaining data
  - Access to data-handling and visualization tools
  - Notification of data-related news
  - Technical support and referrals

For more information about the data centers of the DAAC Alliance and their data and services, see nasadaacs.eos.nasa.gov.

Global Change Master Directory (GCMD)

The GCMD provides information to assist users in locating EOS and other Earth science data sets and services. The GCMD holds Earth science data set and service descriptions that provide vital information to help determine whether the data or service meets the user's needs. Descriptions include information such as location of the data or service, associated investigators and other contacts, spatial and temporal coverage of the data, resolution of the data, and links to the actual data or service.

The GCMD comprehensive database contains more than 13,500 Earth science data set descriptions, and approximately 2,500 new descriptions are added annually. The GCMD database also contains more than 750 Earth science services (software, analytical tools, educational resources, etc.), and grows by approximately 140 new service descriptions annually. More than 25 percent of the GCMD database refers to data from NASA's EOS missions and Earth Science Information Partner (ESIP) data

providers. More than 1,200 data providers contribute to the GCMD database. The GCMD directory of data and services is available online at http://gcmd.nasa.gov.

The GCMD database can be searched for EOSDIS data sets by using free-text or an extensive set of keywords covering all areas of Earth science research including the atmosphere, biosphere, hydrosphere and oceans, snow and ice, geoscience, paleoclimatology, land surface, and human dimensions of global change. Data sets can also be searched by platform (or spacecraft), instrument, data center, geographic location, or project. For example, a user may conduct a search for all data sets from Terra or for data sets collected by the MODIS instrument. If a data set exists in the EDG, a special link will connect the user directly from the description to the EDG so that the data can be browsed or ordered. Other links will direct the user to online data, documentation, and other information.

Earth science-related services (see http://gcmd.nasa.gov/services/) are also searchable. Examples range from specialized tools for browsing, manipulating, and visualizing EOS data products to Earth science educational products and environmental hazard advisory services. Users can search the services database using controlled keywords or free-text to discover data-set-specific tools.

Note: Use the GCMD to search for information about data and services. To order EOSDIS data, use search-and-order systems such as the EDG or DAAC-specific systems.

Federation Interactive Network for Discovery (FIND)

The FIND Web-based system serves as the user interface for accessing data within the NASA Earth Science Information Partner (ESIP) Federation. Users are able to locate data and information held by members of the Federation. (DAAC Alliance centers are Type 1 ESIPs.) The Federation partners bring together government agencies, universities, nonprofit organizations, and businesses in an effort to make Earth science information available to a broader community. An objective of the Federation is to evolve methods that make Earth science data easy to preserve, locate, access, and use for all beneficial applications. For more information about the ESIP Federation and member organizations, see page 7-1 or the Web at http://www.esipfed.org/.

FIND incorporates EOSDIS data available from the DAAC Alliance data centers as well as data from other Federation members. FIND is based on the Mercury system (see page 6-5). For information and access to the FIND system, see http://mercury.ornl.gov/esip.

Section 6

Many of the data sets available from the DAAC Alliance require the use of special tools for image processing and analysis. These tools were created either within the data centers or by external software developers and data users. The DAAC Alliance Tools Web page gives information about the tools and provides links to data tool Web pages for many of the DAAC Alliance data centers. See http://nasadaacs.eos.nasa.gov/tools.html.

The data centers also provide center-unique tools for functions such as searching and subsettting data. The table below lists and describes some of the data-handling and service tools available from the DAAC Alliance.

Data Center	Data Tool/Service	Description
ASF	SAR Software Tools	ASF's Technical Services Office (TSO) creates new software tools and improves existing tools. The software section of the ASF Web site introduces the concepts of interferometric synthetic aperture radar (InSAR), provides tutorials for the tools, and includes an area for downloading developed software via FTP. See http://www.asf.alaska.edu/software/.
	• InSAR Concepts	InSAR concepts explain how SAR interferometry works.
	• Man Pages	The Man Pages for each program (available after the software tools are installed) provide quick reference. They give background information useful for better understanding how a particular tool works.
	• Tutorials	Tutorials describe the tools developed for processing SAR data. They explain what the tools do and show functionality using practical examples. Tutorials are available on data handling, image calibration, geocoding, image mosaicking, DEM generation (description of how to create a DEM from InSAR data), and terrain correction.
GES DAAC	AIRS Data Tools	The AIRS Support Team has made available many tools designed to handle HDF-EOS data (AIRS standard format). See http://daac.gsfc.nasa.gov/atmodyn/airs/airs_tools.html.
	• AIRS Online Channel/Variable Subsetter	The AIRS subsetter provides channel and/or variable subsetting of Level 1B and Level 2 data products. The subset files are staged on an anonymous FTP site and the user is notified to download the output files.
	• HDF_READER	This command-line program allows a user to view the contents of an HDF file, as well as subset the data therein. Data can be subset along any dimension, or the entire data can be dumped if no subset options are given. There is also a mode to print a hierarchical tree list of the objects in the file. Data can be sent to an ASCII text file, a set of flat binary files, or displayed on the screen (default).
	Online Analysis Tools	The GES DAAC provides tools for online analysis of various Earth science data products.
	• MOVAS	The MODIS Online Visualization and Analysis System (MOVAS) is designed for visualization and analysis of the MODIS Level 3 atmospheric monthly global products. See http://lake.nascom.nasa.gov/www/online_analysis/movas/monthly/index.shtml.
	• OASIS	The Online Analysis (OASIS) tool is designed for searching, selecting, and performing simple analysis of Earth science data. Users can perform data quality checks and data visualizations when searching and ordering data online. See http://daac.gsfc.nasa.gov/CAMPAIGN_DOCS/atmospheric_dynamics/online_analysis/OASIS.

Data Center	Data Tool/Service	Description
GES DAAC (continued)	• TOVAS	The TRMM Online Visualization and Analysis System (TOVAS) is designed for visualization and analysis of the TRMM Level 3 rainfall products and other precipitation products. See http://daac.gsfc.nasa.gov/hydrology/TRMM_analysis.html.
	WHOM	The Web-based Hierarchical Ordering Mechanism (WHOM) is a search-and-order system that allows the user to search the GES DAAC data archive in several ways: (1) Data Pool, which allows the user to search most frequently requested data sets, (2) Earth science data type, and (3) data set. WHOM has the following functionalities: • Attribute filtering—Users can search by using spatial, temporal, parameter (Ocean Level 3), and day/night flag criteria. • Ocean parameter subsetting—This function is implemented for Level 2 and Level 3 data. Users can select and order only the parameters they need. For Level 2, the subset file incorporates all requested parameters, corresponding quality arrays, and geolocation arrays. • On-demand channel/band subsetting—Users request only the channels (bands) they need from Level 1B calibrated radiances. This function is implemented for MOD021KM and MYD021KM data. See http://daac.gsfc.gov/data/.
GHRC	Data Search Web Site	GHRC provides several ways to access data at GHRC and elsewhere. See http://ghrc.msfc.nasa.gov/ghrc/search.html.
	• Coincidence Search Engine	This search engine allows a user to determine when up to four satellites were within a geographic area or within a specified distance of each other simultaneously.
	• HyDRO	The Hydrologic Data Search, Retrieval, and Order (HyDRO) system allows the user to search data set holdings at GHRC. HyDRO provides a list of GHRC data sets specific to the user's requirements. Users are able to browse the online information for each data set. They can download online data sets by FTP or place an order to be mailed on tape or CD-ROM.
	• SSM/I Subsetter	The SSM/I subsetter allows a user to subset the online SSM/I swath (pass) 10-day data by selecting a date range and geographic region. The swath files that contain data in a region of interest will be tarred together (one file per day). Files are retrievable via FTP.
	HEW Subsetter	The HDF-EOS Web-based (HEW) data-set-independent tool can subset formatted HDF-EOS data files on latitude and longitude bounding boxes as well as date and time spans. HEW is able to select only the channel information desired from an HDF-EOS file. See http://subset.itsc.uah.edu/hew/.
	NLDN Subsetter	The National Lightening Detection Network (NLDN) subsetter uses the latitude and longitude of a geographic box and the time period of interest to reduce data volume. This subsetter zips through the NLDN data set for the designated time period, and repackages the data into daily files containing only those lightning events that occurred in the user-defined box. Use of data from this tool is available to researchers authorized to receive NLDN data, a commercial, licensed product. Users can make data-subsetting requests by phone or e-mail to GHRC User Services. See http://ghrc.msfc.nasa.gov/uso/nldnsub/nldn.html.

Data Center	Data Tool/Service	Description
LaRC DAAC	ASDC Data Pool	The Data Pool at the LaRC Atmospheric Sciences Data Center (ASDC) is an online, short-term data cache that provides Web links and FTP access to selected ASDC science data products. See http://eosweb.larc.nasa.gov/HPDOCS/datapool/.
	CERES Subsetting	This tool allows users to subset select CERES data products while placing an order using the Java version of the Langley Web Ordering Tool. The data can be subset by latitude and longitude, start and end time parameter and criterion. The following CERES data products can be subset: Clouds and Radiative Swath (CRS), ERBE-like Instantaneous TOA Estimates (ES-8), and Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF). See http://eosweb.larc.nasa.gov/JORDER/ceres.html.
	MISR Browse Atlas	The MISR Browse Atlas virtually displays time series of MISR browse images for selected regions. See http://eosweb.larc.nasa.gov/HPDOCS/misr/.
	MISR Browse Tool	The MISR Browse Tool allows easy access to images from the MISR instrument. The browse images are ellipsoid color images for each camera, reduced to 2.2 km resolution. The MISR red, green, and blue bands are used to create the color image, which has been intentionally clipped and gamma-stretched to make cloud, ocean, and land features visible. The images are JPEG format. See http://eosweb.larc.nasa.gov/MISRBR/.
	MISR Subsetting Tool	This tool allows users to subset MISR data ordered through the EDG. The data can be subset by latitude and longitude coordinates, MISR block number, or parameter. This tool extracts the specified data and outputs a smaller file in the same format as the original file. See http://eosweb.larc.nasa.gov/PRODOCS/misr/subset_orders.html.
	misr_view	misr_view, a freely available IDL-based display and analysis tool, can be used with many types of MISR and AirMISR data. It was specifically designed for use with files that use the HDF-EOS "grid" interface. These include MISR L1B2 georectified (map-projected) radiance, MISR L1B3 radiometric cloud masks, all MISR Level 2 geophysical products, the MISR ancillary geographic product, and AirMISR L1B2 georectified radiances. See http://eosweb.larc.nasa.gov/PRODOCS/misr/misr_view.html.
	MOPITT Level 2 Viewer	This IDL-based tool creates plots of MOPITT Level 2 data products. See http://eosweb.larc.nasa.gov/PRODOCS/mopitt/tools/moppitt_level2_viewer.html.
	view_hdf	view_hdf is a freely available IDL-based display and analysis tool for accessing data stored in HDF and HDF-EOS files. The tool can select and subset variables from either Science Data Sets (SDS) or vdata structures in a HDF file, render both two- and three-dimensional graphics, and plot geolocated data onto various world map projections. Other features include multiple variable plots, difference plots, and simple statistics. See http://eosweb.larc.nasa.gov/HPDOCS/view_hdf.html.

Data Center	Data Tool/Service	Description
LP DAAC	ASTER Browse Tool	The USGS global visualization view allows users to search, browse, and order ASTER data. Users click on a global locator map to view satellite images in the selected geographic area. See http://LPDAAC.usgs.gov/aster/glovis.html.
	Data Pool	The Data Pool at the LP DAAC is an online archive that currently provides FTP access to select ASTER and MODIS data products. Several data types are available at no charge through the Data Pool. See http://LPDAAC.usgs.gov/tutorial/datapool.html.
	MODIS LDOPE Tools	The MODIS Land Data Operational Product Evaluation (LDOPE) software tools were developed to assist in the quality assessment of MODIS land products. These tools are invoked as standalone executables from a command-line interface. The software is supported on Irix, Solaris, Linux, and Windows operating systems. See http://LPDAAC.usgs.gov/tools/ldope/.
	MRT	The MODIS Reprojection Tool (MRT) enables users to read MODIS Level 2G, Level 3, and Level 4 land products in HDF-EOS format. The software supports spatial subsetting and spectral subsetting, performs geographic transformation to a different coordinate system or cartographic projection, and writes the output to file formats other than HDF-EOS (GeoTIFF, raw, binary). The MRT is supported on several platforms including SGI and Sun UNIX, Windows and Linux. See http://LPDAAC.usgs.gov/tools/modis.
NSIDC DAAC	EASE-Grid Geolocation Tools	EASE-Grid tools include IDL routines and map projections for geolocation, and conversion tools to use with EASE-Grid data sets. See http://nsidc.org/data/ease/tools.html.
	EOS-IT	The HDF-EOS Imaging Tool (EOS-IT) interface has two modes. One mode opens, geolocates, and visualizes multiple swath or grid products in separate but dynamically linked windows. Another mode allows users to examine individual bits from data fields. (Users must have IDL 5.6 to run EOS-IT.) See http://nsidc/org/data/tools/eosit/.
	GISMO	The Graphical Interface for Subsetting, Mapping, and Ordering (GISMO) Web-based tool can be used to search, subset, and order gridded data from NSIDC. Data may be queried by spatial range, temporal range, and data-specific parameters. See http://nsidc.org/data/gismo.
	MS2GT	The MODIS Swath-to-Grid Toolbox (MS2GT) is a set of software tools that read HDF-EOS files containing MODIS swath data and produce flat binary files with gridded data in a variety of map projections. MS2GT consists of three Perl programs that make calls to several standalone IDL and C programs. Documentation for some products is in development. See http://nsidc.org/data/modis/ms2gt/.
	PSQ	The Polar Spatial Query (PSQ) tool allows users to search for orbit and scene data sets by collection, parameter (channel), date, and region of interest. See http://nsidc.org/data/psq.

Data Center	Data Tool/Service	Description
ORNL	FIND	The Federation Interactive Network for Discovery (FIND), based on the Mercury system, allows a user to locate data and information held by all members of the Federation of Earth Science Information Partners. See http://mercury.ornl.gov/esip.
	Global Monthly Climatology Interface	Individual data files of mean monthly surface climate data over global land areas, excluding Antarctica, for nearly all of the twentieth century can be downloaded through this interface. Users first determine the temporal (yearly) range of interest, then select one or more of the six parameters, and decide on a format in which to receive the selected data. See http://daac.ornl.gov/cgi-bin/DAAC/eacm_interface.perl.
	Mercury	Mercury is a Web-based system for searching and retrieving metadata and associated data. Data, documentation, and metadata can reside on the individual data providers' servers. Mercury uses the Internet to form a "virtual system" interconnecting those servers and its central system. Mercury keeps the central metadata current by erasing its database and rebuilding it every night. Mercury supports international metadata standards and is compatible with Internet search engines. See http://mercury.ornl.gov/.
	RivDIS	The RivDIS data set contains monthly discharge measurements for 1,018 stations located throughout the world. The period of record varies widely from station to station, with a mean of 21.5 years. Users can download the entire data set as a single file containing all stations or as separate files for individual stations. The data, which are organized by country, river, and station, can be viewed online as plots and tables. See http://daac.ornl.gov/rivdis/STATIONS.HTM.
PO.DAAC	NEREIDS	The Near-Real-Time Image Distribution Server (NEREIDS) provides sea surface temperature, ocean surface topography, ocean vector winds, and land and sea ice satellite browse images within a few hours of capture. Binary data files are available for some images. Satellite missions include NOAA AVHRR, TOPEX/POSEIDON, Jason-1, and SeaWinds on QuikSCAT. See http://nereids.jpl.nasa.gov/cgi-bin/nereids.cgi.
	POET	Data subsetting and visualization are available from the PO.DAAC Ocean ESIP Tool (POET) Web-based interface. Output is returned as a latitude-longitude map, animation, time-series graph, or space-time profile. Other options include ASCII output, customized plots, and additional output formats including image (GIF, PNG, JPEG), scientific (HDF, netCDF), GIS (GeoTIFF, ArcGrid), and binary (UNIX or PC). This graphical user interface was developed by the Ocean ESIP (Earth Science Information Partner). See http://podaac-esip.jpl.nasa.gov/poet.
SEDAC	DDViewer	The United States Demographic Data Viewer (DDViewer) allows a user to create maps and calculate statistics for 220 demographic variables from the 1990 U.S. Census. This tool maps states, counties, and census tracts. See http://plue.sedac.ciesin.columbia.edu/plue/ddviewer.
	ENTRI	The Environmental Treaties and Resource Indicators (ENTRI) is an online query of a relational database. See http://sedac.ciesin.columbia.edu/entri.

Data Center	Data Tool/Service	Description
SEDAC (continued)	ESI Mapper	The Environmental Sustainability Index (ESI) is a measure of overall progress towards environmental sustainability. ESI was developed for 142 countries. See http:// www.ciesin.columbia.edu/indicators/ESI/index.html.
	Ramsar Wetlands Data Gateway	The Ramsar Wetlands Data Gateway provides access to data and information relevant to wetlands of international importance. It consists of a multilevel, multidisciplinary, and diverse resource base. The database includes spatial, tabular, and graphic data that can be searched via a suite of interfaces, and tailored to fit different user groups and levels of query complexity. See http://sedac.ciesin.columbia.edu/ramsardg/.
	U.S.-Mexico DDViewer	This interactive application provides rapid, interactive data mapping, viewing, and analysis of more than 200 socioeconomic variables that are congruent between the United States and Mexico. This tool is used for browsing and visualizing patterns at geographic levels ranging from regions to counties/municipios, and it may be used to map population, vital statistic, land area, and household data. See http://plue.sedac.ciesin.org/plue/ddviewer/ddv30-USMEX/.

Section 7

Earth Science Enterprise

http://www.earth.nasa.gov

NASA's ESE is dedicated to understanding the total Earth system and the effects of natural and human-induced changes on the global environment. ESE's programs study the interactions among Earth's land, atmosphere, cryosphere, oceans, and biota to advance the new discipline of Earth System Science, with a near-term emphasis on global climate change. ESE's research contributes to the development of sound environmental policy and economic investment decisions.

Earth Observing System

http://eos.nasa.gov

EOS is the centerpiece of NASA's ESE. The EOS program consists of a science component and a data system supporting a coordinated series of polar-orbiting and low-inclination satellites for long-term global observations of the land surface, biosphere, atmosphere, cryosphere, and oceans.

EOS Data and Information System

http://eosdismain.gsfc.nasa.gov/eosinfo/EOSDIS_Site

EOSDIS is the data management system for NASA's Earth science research satellites and field measurement programs. This system commands and controls EOS satellites and instruments, and generates useful products from orbital observations. EOSDIS data centers provide data, archiving, distribution, and information management services to the global research community.

DAAC Alliance

http://nasadaacs.eos.nasa.gov

The DAAC Alliance data centers process, archive, document, and distribute data from NASA's past and current Earth science research satellites and field measurement programs. The DAAC Alliance comprises nine data centers:

- Alaska Satellite Facility (ASF) DAAC – http://asf.alaska.edu
- GSFC Earth Sciences (GES) DAAC – http://daac.gsfc.nasa.gov
- Global Hydrology Resource Center (GHRC) – http://ghrc.msfc.nasa.gov
- Langley Research Center (LaRC) DAAC – http://eosweb.larc.nasa.gov
- Land Processes (LP) DAAC – http://LPDAAC.usgs.gov
- National Snow and Ice Data Center (NSIDC) DAAC – http://nsidc.org/
- Oak Ridge National Laboratory (ORNL) DAAC – http://www.daac.ornl.gov/
- Physical Oceanography DAAC (PO.DAAC) – http://podaac.jpl.nasa.gov
- Socioeconomic Data and Applications Center (SEDAC) – http://sedac.ciesin.columbia.edu

The DAAC Alliance Web site gives information about the data centers and their data, services, and tools. It also offers links to educational resources and features from past and present editions of the DAAC Alliance publication *Supporting Earth Observing Science*. This annual publication highlights how the scientific research community uses EOSDIS data available from the DAAC Alliance data centers.

ESIP Federation

http://www.esipfed.org/

The Earth Science Information Partner (ESIP) Federation is made up of partners from government agencies, national laboratories, universities, nonprofit organizations, and commercial businesses. By working together, the partners are ensuring that quality scientific data and information are made available to a wide community of scientists and nonscientists. Type 1 ESIPs are primarily distributors of satellite and ground-based data sets, as well as standardized products derived from those data. The data centers of the DAAC Alliance are Type 1 ESIPs. Type 2 ESIPs provide data and information products, technology, or services aimed primarily at the Earth science and research communities. Type 3 ESIPs are primarily commercial companies engaged in developing tools for Earth science data. Type 4 ESIPs are the sponsoring agencies of the Federation.

EOS Data Gateway

http://eos.nasa.gov/imswelcome

The EDG is the online search-and-order system for Earth science data products from NASA and affiliated centers. The EDG provides a consistent view of more than 1,800 data products held at several EOSDIS and international data centers. The system allows users to search science data holdings, retrieve high-level descriptions of data sets, view browse images, and place orders for data products.

Global Change Master Directory

http://gcmd.nasa.gov

NASA's GCMD provides descriptions of Earth science data sets and services relevant to global change research. The GCMD holds more than 13,500 data set descriptions and 750 Earth science service descriptions, which consist of information on how to obtain the data or service. The information may also include direct links to the data or service source. The GCMD covers all areas of Earth science including atmosphere and climatology, biosphere and environmental science, hydrosphere and oceans, snow and ice, geoscience, paleoclimatology, land surface, and human dimensions of climate change. The Earth science services cover areas such as data and visualization and GIS products. The GCMD also maintains a global change conference calendar, Earth science Web resources, and a Learning Center for teachers and students.

Scientific Visualization Studio

http://svs.gsfc.nasa.gov

The mission of the Scientific Visualization Studio (SVS) is to facilitate scientific inquiry and outreach within NASA programs through visualization. The SVS works closely with scientists to create visualization products, systems, and processes to promote a greater understanding of the Earth and space science research activities at Goddard Space Flight Center and within the NASA research community. The SVS Web site offers a searchable database of high-resolution scientific animations and data imagery.

Earth Observatory

http://earthobservatory.nasa.gov

NASA's Earth Observatory provides a freely accessible Web publication where the public can obtain new satellite imagery and scientific information about Earth's climate and environmental changes. The site is useful to the public media and educators. Earth scientists and science writers from all NASA centers, as well as all agencies and universities affiliated with NASA's ESE, submit articles and images for publication on this site.

Visible Earth

http://visibleearth.nasa.gov

Visible Earth is a searchable directory of NASA's Earth science-related images, animations, and data visualizations.

Remote Sensing Tutorial

http://rst.gsfc.nasa.gov/start.html

The Applied Information Sciences Branch at NASA's Goddard Space Flight Center developed a remote sensing tutorial to serve as a primer for the new user as well as a teaching tool for the educational community. The *Remote Sensing Tutorial* is a comprehensive, diverse, and up-to-date exposition and review of the history and accomplishments of both NASA's space program and similar endeavors being made by other nations since the era of Sputnik and Explorer. The tutorial explains remote sensing through educational devices such as numerous questions and quizzes, exposure to fundamental principles, and several applications that contribute to learning.

Acronyms and Abbreviations

Section 8

ACCP	Accelerated Canopy Chemistry Program
ACE	Arctic Cloud Experiment
ACES	Altus Cloud Electrification Study
ACRIM	Active Cavity Radiometer Irradiance Monitor
ADEOS	Advanced Earth Observing Satellite
AirMISR	Airborne Multi-angle Imaging SpectroRadiometer
AIACC	Assessments of Impacts and Adaptations to Climate Change
AIRS	Atmospheric Infrared Sounder
ALT	altimeter (TOPEX/POSEIDON)
AMM-1	First Antarctic Mapping Mission
AMPR	Airborne Passive Microwave Radiometer
AMSR-E	Advanced Microwave Scanning Radiometer-EOS
AMSU	Advanced Microwave Sounding Unit
ASCII	American Standard Code for Information Interchange
ARB	Aerosol Research Branch
ARESE	ARM Enhanced Shortwave Experiment
ARM	Atmospheric Radiation Measurements
ASDC	Atmospheric Sciences Data Center
ASF	Alaska Satellite Facility
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVHRR	Advanced Very High Resolution Radiometer
AVIRIS	Airborne Visible/Infrared Imaging Spectrometer
BIL	band interleaved by line
BOREAS	Boreal Ecosystem-Atmosphere Study
CALIPSO	Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations
CAMEX	Convection and Moisture Experiment
CaPE	Convection and Precipitation/Electrification Experiment
CDR	Climate Data Record
CEOS	Committee on Earth Observation Satellites
CERES	Clouds and the Earth's Radiant Energy System
CIDC	Climatology Interdisciplinary Data Collection
CIESIN	Center for International Earth Science Information Network
CLAMS	Chesapeake Lighthouse and Aircraft Measurements for Satellites
CLS	Cloud Lidar System
CODMAC	Committee on Data Management and Computation
CSA	Canadian Space Agency
CZCS	Coastal Zone Color Scanner
DAAC	Distributed Active Archive Center
DDViewer	Demographic Data Viewer
deg	degree
DEM	digital elevation model
DMSP	Defense Meteorological Satellite Program
EASE	Equal Area Scalable Earth
ECS	EOSDIS Core System
EDG	EOS Data Gateway
ENTRI	Environmental Treaties and Resource Indicators
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
EOS-IT	HDF-EOS Imaging Tool
EP	Earth Probe
ERB	Earth Radiation Budget
ERBE	Earth Radiation Budget Experiment
EROS	Earth Resources Observation Systems
ERS	European Remote Sensing Satellite
ESA	European Space Agency
ESE	Earth Science Enterprise

ESI Environmental Sustainability Index

ESIP Earth Science Information Partner

ETM+ Enhanced Thematic Mapper Plus

FIFE First ISLSCP Field Experiment

FIND Federation Interactive Network for Discovery

FIRE First ISCCP Regional Experiment

FLUXNET Global Flux Tower Network

FTP file transfer protocol

GAC global area coverage

GBFM Global Boreal Forest Mapping

GCMD Global Change Master Directory

GDR Geophysical Data Record

GEDEX Greenhouse Effect Detection Experiment

GES GSFC Earth Sciences (DAAC)

GHRC Global Hydrology Resource Center

GHz gigahertz

GIS Geographic Information System

GISMO Graphical Interface for Subsetting, Mapping, and Ordering

GLAS Geoscience Laser Altimeter System

GLCTS Global Land Cover Test Sites

GMAO Global Modeling and Assimilation Office

GOES Geostationary Operational Environmental Satellite

GOTOPO30 Global 30-Arc-Second Elevation Data Set

GPS Geophysical Processor System

GPW Gridded Population of the World

GRACE Gravity Recovery and Climate Experiment

GRFM Global Rain Forest Mapping

GSFC Goddard Space Flight Center

GTE Global Tropospheric Experiment

HDF Hierarchical Data Format

HDF-EOS HDF for the Earth Observing System

HEW HDF-EOS Web-based (tool)

HRPT High Resolution Picture Transmission

HSB Humidity Sounder for Brazil

HyDRO Hydrologic Data Search, Retrieval, and Order (tool)

IGDR Interim Geophysical Data Record

ICESat Ice, Cloud, and Land Elevation Satellite

InSAR Interferometric Synthetic Aperture Radar

IR infrared

ISCCP International Satellite Cloud Climatology Project

ISLSCP International Satellite Land Surface Climatology Project

ISIN Integerized Sinusoidal

IWG Investigator Working Group

JERS Japanese Earth Remote Sensing

JPL Jet Propulsion Laboratory

km kilometer

LAC LEISA Atmospheric Corrector Local Area Coverage

LaRC Langley Research Center

LASE Lidar Atmospheric Sensing Experiment

LBA Large-Scale Biosphere-Atmosphere Experiment in Amazonia

LDOPE Land Data Operational Product Evaluation

LEISA Linear Etalon Imaging Spectrometer Array

LIDAR Light Detection and Ranging

LIS Lightning Imaging Sensor

LITE Lidar In Space Technology Experiment

LP Land Processes (DAAC)

m meter

MAPS Measurement of Air Pollution from Satellites

MAS MODIS Airborne Simulator

MCSST Multi-Channel Sea Surface Temperature

MGDR-B	Merged Geophysical Data Record-B
MISR	Multi-angle Imaging SpectroRadiometer
MODIS	Moderate Resolution Imaging Spectroradiometer
MOPITT	Measurements of Pollution In The Troposphere
MOVAS	MODIS Online Visualization and Analysis System
MRT	MODIS Reprojection Tool
MS2GT	MODIS Swath-to-Grid Toolbox
MSU	Microwave Sounding Unit
NARSTO	North American Research Strategy for Tropospheric Ozone
NASA	National Aeronautics and Space Administration
NASDA	National Space Development Agency of Japan
NAVOCEANO	Naval Oceanographic Office
NCSA	National Center for Supercomputing Applications
NDVI	Normalized Difference Vegetation Index
NEREIDS	Near-Real-Time Image Distribution Server
netCDF	network Common Data Form
NISE	Near-Real-Time Ice and Snow Extent
NLDN	National Lightning Detection Network
nm	nanometer
NOAA	National Oceanic and Atmospheric Administration
NPP	Net Primary Productivity
NSCAT	NASA Scatterometer
NSIDC	National Snow and Ice Data Center
NVAP	NASA Water Vapor Project
OASIS	Online Analysis (tool)
ORNL	Oak Ridge National Laboratory
OSDR	Operational Sensor Data Records
OST	Ocean Surface Topography
OTD	Optical Transient Detector
OTTER	Oregon Transect Ecosystem Research
PAN	panchromatic
PLACE	Population, Landscape, and Climate Estimates
PM-ESIP	Passive Microwave Earth Science Information Partner
POAM	Polar Ozone and Aerosol Measurement
PO.DAAC	Physical Oceanography Distributed Active Archive Center
POES	Polar Operational Environmental Satellite
POET	PO.DAAC Ocean ESIP Tool
POLDER	Polarization and Directionality of Earth's Reflectances
PR	Precipitation Radar
PROVE	Prototype Validation Exercise
PSQ	Polar Spatial Query (tool)
PSR	Polarimetric Scanning Radiometer
RAMP	RADARSAT Antarctic Mapping Project
RGPS	RADARSAT Geophysical Processor System
RivDIS	River Discharge
SAFARI	Southern African Regional Science Initiative
SAGE	Stratospheric Aerosol and Gas Experiment
SAM	Stratospheric Aerosol Measurement
SAR	Synthetic Aperture Radar
SCAR	Sulfates/Smoke, Clouds, and Radiation
SCF	Scientific Computing Facility
SDP	standard data product
SeaWiFS	Sea-viewing Wide Field-of-view Sensor
SEDAC	Socioeconomic Data and Applications Center
SIM	Spectral Irradiance Monitor
SIN	Sinusoidal
SIPS	Science Investigator-led Processing System
SLC	single-look complex

SMMR	Scanning Multichannel Microwave Radiometer
SNF	Superior National Forest
SOLSTICE	Solar Stellar Irradiance Comparison Experiment
SORCE	Solar Radiation and Climate Experiment
SRB	Surface Radiation Budget
SSE	Surface Solar Energy
SSH	sea surface height
SSHA	sea surface height anomaly
SSM/I	Special Sensor Microwave/ Imager
SST	sea surface temperature
STF	Sky Telemetry Format
SUCCESS	SUbsonic aircraft: Contrail Cloud Effects Special Study
SWIR	shortwave infrared
TARFOX	Tropospheric Aerosol Radiative Forcing Observational eXperiment
TEFLUN	Texas and Florida Underflights
TES	Tropospheric Emission Spectrometer
THORpex	THe Observing-system Research and predictability experiment
TIM	Total Irradiance Monitor
TIR	thermal infrared
TIROS	Television and Infrared Observation Satellite
TMI	TRMM Microwave Imager
TOA	top of atmosphere
TOGA-COARE	Tropical Ocean Global Atmosphere-Coupled Ocean Atmosphere Response Experiment
TOPEX	TOPography EXperiment
TOMS	Total Ozone Mapping Spectrometer
TOVS	TIROS Operational Vertical Sounder
TRMM	Tropical Rainfall Measuring Mission
UARS	Upper Atmosphere Research Satellite
UAV	uninhabited aerial vehicle
USGS	U.S. Geological Survey
UV	ultraviolet
VEMAP	Vegetation/Ecosystem Modeling and Analysis Project
VIL	Volume Imaging Lidar
VIRS	visible/infrared scanner
VIS	visible
VNIR	visible and near infrared
WHOM	Web-based Hierarchical Ordering Mechanism
WOCE	World Ocean Circulation Experiment
XPS	Extreme Ultraviolet Photometer System

National Aeronautics and
Space Administration

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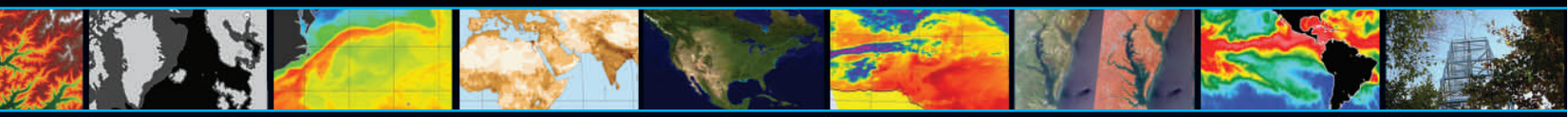

Earth Science Enterprise

…to understand and protect our home planet